FIELD CROP ABSTRACTS

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REVIEW ARTICLE

TRANSPIRATION FROM CROP PLANTS

BY

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INTRODUCTION

Transpiration so often leads to depletion of the water content of the soil with a consequent retardation of growth that we must recognise it as one of the chief factors contributing to seasonal variations in yield. There are two main practical issues — first, problems of estimation of the amount of water lost and, secondly, knowledge of the relation between growth and soil-water content. Estimation of the rate of loss requires an understanding of the system, which involves the purely physical processes of evaporation within the leaf and diffusion of water vapour from it in response to a concentration gradient. The rate of this transfer is therefore determined by the magnitude of the difference in vapour pressure and by the size of the resistances in the diffusion path. The location of these resistances is well known but the significance of their inter-relationships and quantitative changes is less clearly appreciated. It is the object of this review to discuss the main features of the transpiration system, describing in some detail its components and relating these to the more accurate methods for estimating transpiration in the field.

COMPONENTS OF THE TRANSPIRING SYSTEM

(A) VAPOUR PRESSURE OF THE EVAPORATING SURFACE

If we assume that the vapour pressure of the evaporating surface, located within the walls of mesophyll cells, is that of pure water at the same temperature the degree of departure from this assumption, which arises from the resistance to flow of *liquid* water through the plant from the soil, may be examined. If these resistances are high or the supply of water in the soil is low, then water loss will exceed absorption and the water content of the leaves will fall. Empirical experiments in which the water content of wheat leaves was varied over the range from full turgidity to around 70% full turgidity (about wilting) have shown that there is little influence of water content on transpiration rate when other factors (such as the stomata) are kept constant (11), (28). This conclusion is substantiated by Williams and Amer (67) who have shown that the transpiration rate is independent of leaf-water content over a substantial part of the range between full turgidity and wilting. The assumption of Hygen (20), (21) that transpiration rate falls concurrently with leaf-water content over the entire range does not hold.

On other grounds, the influence of water content of the leaf cells on transpiration rate would also be expected to be small. It was pointed out by Homan *et al.* (15) and more elegantly by Spanner (56) that the suction potential (diffusion pressure deficit) of the water inside a cell and the reduction in vapour pressure below saturation is given by

$$S = \frac{RT}{V_o} \ln \frac{e_s}{e}$$

where e_s and e are the vapour pressures at saturation (S = O) and suction potential S, respectively, R the gas constant (= 82·06 atm. per °C. per g. molecule), T the absolute temperature and V_o the molecular volume of water (= 18). Irrespective of the microscopic structure surrounding the evaporating surface, we would expect its suction potential to be close to that of the adjacent mesophyll cell. Many observations (8) suggest that at wilting the suction potential of crops is rarely greater than 25 atmospheres, although more recent observations (55) suggest values around 40 atmospheres in woody species. For example, at 20°C. (7), e_s is 17·54 mm. Hg ; e at S = 27 atm. would be 17·19 mm. Hg. Assuming the atmosphere to be 50% saturated, its vapour pressure would be 8·77 mm. Hg ; i.e. transpiration would be reduced by 4% under these conditions by a reduction in the water content from full turgidity to wilting. In soil well supplied with water, the suction potential of leaf cells rarely exceeds 1 – 5 atm. The reduction in vapour pressure of the evaporating surface within the leaf below that of pure water is therefore negligible. The degree of this reduction depends slightly on temperature ; nevertheless, the general conclusion holds that, over the range from full turgidity to wilting and even to death of the cells from desiccation, the changes in vapour pressure are extremely small in relation to the vapour-pressure difference between the evaporating surface in the leaf and the atmosphere. This is illustrated in Fig. 1, which shows the relative magnitude of these changes in the more saturated range. The suction potential of the atmosphere extends far beyond the range shown, being 1220 atm. at a vapour-pressure deficit of 10·52 mm. Hg (40 % relative humidity) and 2140 atm. at 14·03 mm. Hg (20% R.H.). It follows that any effective resistance to the movement of water from the plant must be located in the path of the diffusing vapour (16). This is not to say that resistances

in the path of the liquid water are not important but rather that any resistance to flow in this phase or shortage of water in the soil can only exert an influence on the loss of water by changing some resistance in the vapour path. To measure transpiration, *we need therefore to measure only those components in the vapour phase of the transpiration stream.*

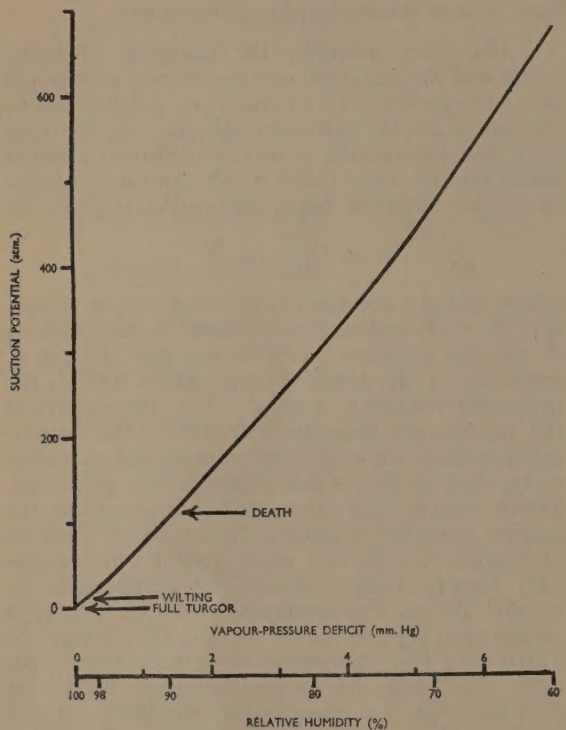

Fig. 1. Change in suction potential with reduction in vapour pressure below the saturation vapour pressure at a temperature of 20°C. This may also be taken as the vapour pressure difference between the leaf and the atmosphere at different degrees of saturation as indicated by the values of relative humidity. (Wilting is assumed to occur with a suction potential of 15 atm., and death when a cell of 26 atm. osmotic pressure at full turgidity has lost 70% of its water.)

(B) DIFFERENCE IN VAPOUR PRESSURE BETWEEN LEAF AND AIR.

The rate of transpiration (T) may be represented by

$$T = \frac{D\ (e_s - e)_a}{R} \quad \ldots\ldots\ (1)$$

where D is a coefficient of diffusion, e_s the vapour pressure at the evaporating surface within the leaf and e_a that of the ambient air, and R the total resistance to diffusion of water vapour from the liquid surface to the zone where e_a is measured. Water vapour moves in response to the difference in vapour pressure ; hence all factors enhancing this difference will increase transpiration. As the liquid surface within the leaf has effectively the same vapour pressure as water at the same temperature, its vapour pressure will be determined by the temperature of the evaporating surface (cf. Fig. 2). Measurement of this temperature is notoriously difficult ; leaf temperatures cannot be regarded as providing more than an approximation.

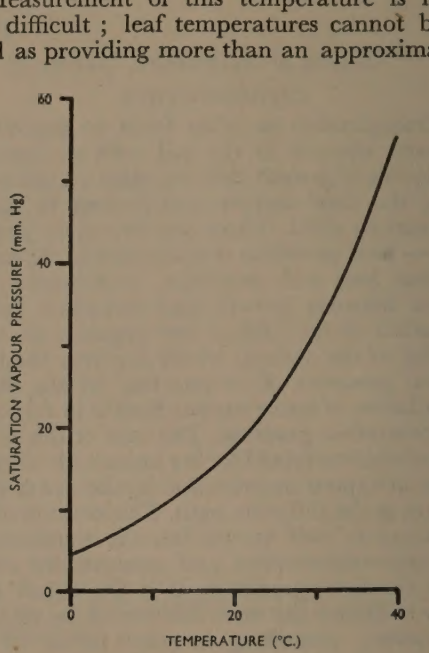

Fig. 2. Change in the saturation vapour pressure of water with temperature.

The vapour pressure of the air is fairly constant on most clear days and the seasonal and diurnal variations in transpiration undoubtedly follow mainly from the changes in vapour pressure of the leaf surface which occur in response to differences in radiation. Whether the daily curve of transpiration is displaced both in phase and amplitude from that of radiation (5) or whether it is co-incident (29), (30) depends mainly on the surroundings of the plant and the type of weather —which influence the heat exchange between the leaf and the surrounding air—and also on changes in one or more of the resistances included in the term R above.

(C) RESISTANCES TO VAPOUR FLOW FROM THE LEAF

It is now certain that the surface of cell walls bordering on air spaces is covered with a layer of wax (63), (23). Electron photomicrographs of sections through wheat leaves (unpublished) show that this layer is about 500–600 Å thick and consists of a matrix of both waxy and non-waxy material. We may assume therefore that the surface of liquid water from which evaporation occurs is contained *within* the walls of cells abutting on air spaces of the mesophyll and also within the walls of

epidermal cells. Movement of water vapour to the surface of the leaf occurs by two separate pathways: (i) by evaporation within the mesophyll cell walls and diffusion through the cell wall, sub-stomatal cavities and the stomata ; and (ii) from within the epidermal cell walls and through the cuticle. The proportion of vapour diffusing by either pathway depends on the resistance to diffusion of each ; thus, the total resistance to flow up to the surface of the leaf may be represented by the sum of the resistance of each pathway joined in *parallel*. Moreover, there is a further resistance to flow joined in series with these internal resistances ; i.e. the resistance to bulk diffusion away from the surface as a whole (the external resistance).

Although quantitative estimates of all the components of the vapour path for any one species have not yet been made, they are being explored in the wheat leaf. An informed guess from an examination of this leaf suggests that the conductances (reciprocals of resistance) of the cell wall and of the sub-stomatal cavities are both high (each of the order of 25 cm./cm.^{2} surface). It is unlikely that the latter changes appreciably over a wide range of conditions and, although the former probably does change on wilting (28), the extent is small relative to that of the stomata. Little precision is sacrificed then in neglecting the cell wall and the sub-stomatal cavities completely. The total resistance to diffusion then consists of the resistances of the stomata and the cuticle in parallel being joined in series with the external resistance. The total resistance (R) is given by

$$R = d + \frac{1}{S_c + S_D} \quad \ldots\ldots \quad (2)$$

where d is the external resistance and S_c and S_D the conductances (reciprocals of resistance) of the cuticle and stomata, respectively.[1]

STOMATAL AND CUTICULAR CONDUCTANCES FOR DIFFUSION

Quantitative estimates of the stomatal (S_D) and cuticular (S_c) conductances are extremely scanty. Penman and Schofield (42) estimate from geometrical attributes that S_D varies from 0 (when closed) to 12·8 cm./ cm.^{2} leaf. Preliminary estimates for the wheat leaf from porometer experiments suggest a maximum value of about 14·5 cm./ cm.^{2} leaf under laboratory conditions. Bange (2) has estimated the range of S_D found in *Zebrina*. There is little information on the quantitative change of stomatal conductance of field crops over the normal range of agricultural conditions. Penman and Schofield (42) and Penman (40) have taken account by their " day-length " factor of the general behaviour of opening during the day and closure at night ; however, it seems likely that *maximum* opening is rarely realised throughout the entire day. It is well established that stomata do not open when the water supply is short (24). Closure also occurs even with ample soil water if plants are exposed to hot dry winds, as shown by Oppenheimer and his colleagues (32), (33). Indirect evidence from published work on wind (68), (22) and direct unpublished laboratory experiments show that the stomata partially close as a direct consequence of increased wind speed. The significance of this response under field conditions is not known.

Estimates of cuticular conductances are also few, although there is ample information to show that for all crops this is small relative to the stomatal conductance when the stomata are open. (In wheat, S_c is estimated as 0·2 cm./cm.^{2} leaf). It is unlikely that there is much loss of precision by assuming the cuticular conductance is zero if the stomata are normally open. However, if the stomata are nearly or fully closed during a substantial part of the day, as is likely when soil moisture is short, then estimates of this component are important. Qualitative data suggest that there are substantial differences between different species (9), (10), (31). Differences in cuticular conductances may therefore explain some differences in transpiration rate between different crops over a restricted range of conditions, as well as differences in drought resistance between some species.

EXTERNAL RESISTANCE

The external resistance (d), i.e. the resistance encountered by the vapour moving away from the leaf or a population of leaves[2], is beyond doubt one of the most important factors influencing the rate of transpiration. This resistance is a function solely of surface dimensions and the degree of ventilation. For small surfaces in a wind tunnel, exact estimates are available (43), (44) and these may be applied to single leaves (42), (26). However, in the field the situation is far less clear. With extended areas of vegetation providing a complete cover of the

[1] The total resistance of the diffusion path is exactly described by $R = d + \frac{1}{S_c + S_D / [1 + S_D (1 / S_I + 1 / S_W)]}$ where S_I and S_W represent the conductances of the substomatal cavities and the cell wall, respectively. For the wheat leaf, this reduces to $R = d + \frac{1}{S_c + 0{\cdot}98\ S_D}$ cm. / cm.^{2} leaf surface.

[2] This impedance depends ultimately on the transport mechanisms concerned. A small free-water surface exposed to laminar flow will induce, by frictional drag, a layer with velocity decreasing from that of the free air stream to zero at the surface; the thickness of this layer will increase with increasing distance from the leading edge. Movement of vapour in this layer will be partly by molecular diffusion and partly by laminar flow. In the field, a similar situation will be found around each leaf, but transport away from the population of leaves will be mainly by turbulent transfer. See Sutton (58) for a general exposition of this process.

ground surface, the size of this resistance will be a function of wind speed and surface roughness. The only available estimate is that of Penman and Schofield (42) for turf; they found $d = \frac{0{\cdot}65}{1 + u \times 10^{-2}}$ cm. where u is the wind speed at 2 m. in miles/day. Thus, d is the order of 0·2 — 0·3 cm. at normal wind speeds, compared with a stomatal resistance of about 0·1 — 0·16 cm., i.e. about twice as great. This estimate is likely to be reasonably exact at those times when the leaf cover is dense and complete, such as with short thick grass. For row crops over a large part of the growing period and tree crops, it is likely to differ (40). It will be some function of the degree of cover and the surface contour of the crop. Moreover, Rider (47) has shown that the degree of ventilation of a cereal crop varies with the height (and presumably leaf density) and also with the wind velocity at any one crop height.

There is now sufficient evidence to show that the external resistance to diffusion is a major component influencing transpiration. Neglect of this factor and of the size and arrangement of the three main components in the vapour path led Brown and Escombe and other investigators to false conclusions regarding the control of transpiration and particularly the rôle played by the stomata (42), (28). The significance of variation in the three factors is illustrated in Fig. 3. From equations (1) and (2), transpiration rates at a constant vapour-pressure difference have been calculated for the range of stomatal conductance and the extremes of external resistance likely to be experienced in the field. The importance of the external resistance and of the stomatal conductance particularly with low external resistance (high wind speeds) is clear. The size of the cuticular component is, of course, only important at low stomatal conductances, as is illustrated by the curves for cuticular conductances of 0·2 cm./cm.^{2} (that of wheat) and 0 (possibly that of some xerophytes).

Fig. 3 must be regarded only as illustrative of the ranges likely to be found. As with stomatal conductance, there is little or no evidence of the quantitative variation in external resistance between crops or for any one crop at different stages of growth. Attention to this aspect, which would involve a complex physical analysis, should clarify much of the present uncertainty concerning differences in transpiration between different crops and at different stages of growth. It is now becoming generally accepted that different crops transpire at much the same rate provided the leaf cover is complete and there is ample soil water (40). Nevertheless, Rider (49) has shown differences in the measured rates of transpiration between grass, peas and brussel sprouts (but see p. 5). Moreover, development of the leaf cover to the extent that all incoming radiation is intercepted occurs only over a portion of the growing season of most crops except grass.

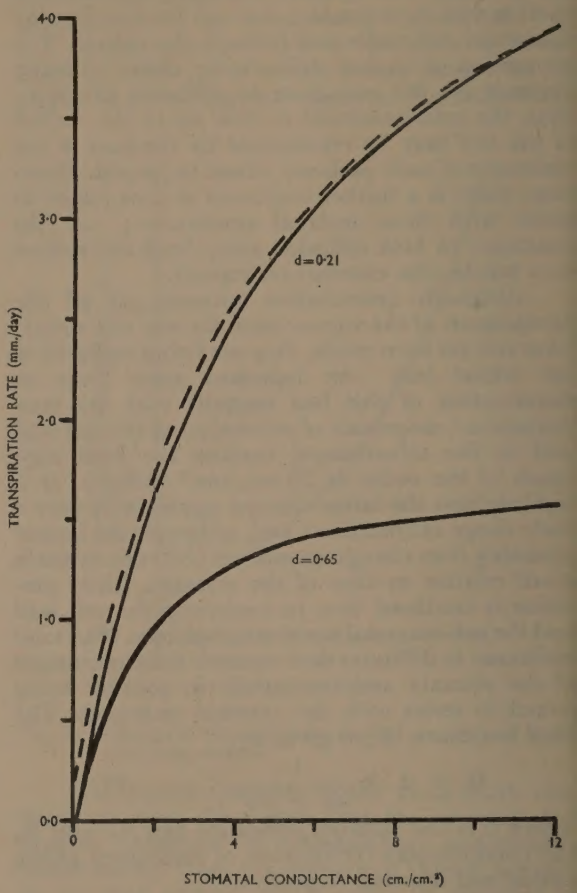

Fig. 3. Diagram illustrating the influence of external resistance (d), stomatal conductance, and cuticular conductance on transpiration over the range likely to be experienced by a field crop. The continuous lines are for a leaf with zero cuticular conductance, the broken line for a leaf with conductance of 0·2 cm./cm.^{2} (near to that of wheat). d=0·65 cm. is taken as the external resistance in still air, and d=0·21 that with a wind speed of 240 m.p.d. A constant vapour-pressure difference of 5 mm. Hg is assumed throughout.

METHODS FOR MEASURING TRANSPIRATION

Modern methods for determining the amount of water lost by transpiration may be roughly grouped into those involving (i) measurement of weather parameters and (ii) changes in soil moisture.

MEASUREMENT OF WEATHER PARAMETERS

All methods which depend on calculating the rate of water loss from changes in certain elements of the weather necessarily assume that variation in

plant parameters may be neglected. Their application is therefore restricted to the wetter ranges of soil moisture and to the less extreme ranges of evaporation potential. Among such methods (reviewed by Penman (41)) three may be mentioned here. The relationship between transpiration and a (variable) exponent of the evaporation from a standard tank has been suggested by Prescott (45). The validity of the relationship has not been widely tested, although some success has been achieved (6). The relationship between potential evaporation and mean air temperature proposed by Thornthwaite (61) has been widely accepted by geographers but has little value for providing direct estimates of losses from growing crops.

The third and by far the most successful relationship is that derived by Penman (38), (40), (41). Combining the two basic principles of evaporation — vapour transport and energy balance — it allows the estimation of potential transpiration from the measurement of total radiation and cloudiness, or less exactly, hours of sunshine [cf. (3) and (4) for empirical relationships between these factors], vapour pressure of the air, mean air temperature and wind speed. A term for stomatal conductance is included (42), (40), although it is assumed that this does not vary appreciably. This relationship[1] therefore combines all the factors which directly influence the transpiration rate.

Empirical verification has shown it to be satisfactory when used over long periods (39); over shorter periods it would appear to be as accurate as most direct methods. It seems certain that, of all the present approaches to problems of transpiration, advances are most likely to come from a wider examination of this relationship — not by adding to or re-arranging the parameters involved, but from better estimates of their values over a wider range of conditions. For example, a closer examination of the identity of the transfer coefficients of heat and vapour (which is assumed in deriving the relation) over different surfaces is required. Pasquill (35) and Rider (48) have suggested differences of 8 – 20 %. The vapour transport equation (E_a) used by Penman is strictly valid for short grass only and should be explored for different crops and for crops with differing degrees of leaf cover. Variation in the plant parameters S and D require further investigation, including particularly variations in the diffusive conductance of the stomata of different crops with ample water supply, with large vapour-pressure differences and with high wind speeds (cf. stomatal closure in hot dry winds (32)). Lastly, we require more information on the influence of the amount of available water in the soil — if it can ever be measured — although, as shown earlier, the effect of this factor on transpiration will be known if stomatal (and cuticular) conductances are known. Given the above information, the Penman formula would provide not only a more exact estimate of the "potential transpiration" — defined by Penman (41) as "the amount of water transpired in unit time by a short green crop, completely shading the ground, of uniform height and never short of water" — but it would yield accurate estimates of actual transpiration over a wide range of conditions.

Two methods have been suggested which are independent of the nature of the surface over which the measurements are made and require no interference with that surface. The estimation of the vapour flux and the wind profile over a surface as expressed on the Thornthwaite and Holzman (62) equation has been developed by Pasquill (34), (36) and Rider (47). Theoretically sound and capable of producing useful results in the hands of an experienced investigator (49), this method nevertheless has serious practical disadvantages. The height above the ground surface where turbulent transfer is zero becomes an important parameter which is extremely difficult to measure and which varies with height of the crop and with wind velocity (47). Moreover, the relationship involved assumes conditions of neutral stability and independence of the shearing stress with height; both being conditions which are rarely realized. Swinbank (59) has described a method based on simultaneous measurement of upward eddy velocity and fluctuation in vapour pressure. Although it has not been widely used, this appears to be an excellent method for measurements over short periods of time. It does involve, however, a very fine technique and tremendous labour in computation. Recent refinements in technique, including automatic integration of the readings (60), are likely to increase the value of this technique as a practical research method.

MEASUREMENT OF SOIL WATER

The simplest and possibly the most satisfactory method is to weigh a portion of the crop and soil in which it is growing and which is exposed to the same conditions as the field in question. Difficulties arise in arranging that the samples weighed are exactly comparable with that of the field, particularly to obtain a similar root distribution and to

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[1] $$E_T = \frac{\Delta H + \gamma E_a}{\Delta + \gamma/SD}$$

where E_T is the rate of transpiration, Δ the slope of the saturation vapour pressure curve at the mean air temperature, γ a conversion factor, E_a a transport equation depending on wind speed and vapour-pressure difference, H the energy available at the surface (= incoming radiation less that reflected and re-radiated), S stomatal conductance and D a day-length factor accounting for the proportion of the day when the stomata are open.

ensure that the surface exposures are exactly comparable. A most useful aid in this approach is the ingenious weighbridge designed at the National Institute of Agricultural Engineering (29), which allows the measurement of a gross load of 200 kg. with an accuracy of ±10 g. This will assist the investigation of variation in the external resistance of different crops at different stages of growth and other similar problems, although difficulty again arises with deep-rooting species or in the drier ranges of soil water.

An integrated value over long periods of time is of course reflected in changes of soil moisture. Despite many suggestions and much work, there still appears to be no reasonable and accurate method for measuring soil water. The main difficulties arise from the large local variation in water content due to differences in surface contours, soil structure and root distribution. Despite the labour of sampling, the well-tried method of oven-drying still has much to recommend it. A method based on the scattering of neutrons by hydrogen atoms (see Holmes (13) for references) has possibilities for providing an integrated reading throughout the profile at consecutive points of time.

Measurement of soil tension by tensiometers (wetter range), gypsum block (drier range of soil water) or nylon resistance units (entire range), although valuable for other purposes, can provide only approximate estimates of soil-water contents. The high association between tension and clay content (1) and the extreme variability of the latter impose large sampling problems. Further, the differential absorption of water from different zones arising from differences in root growth impose a further source of variation. The difficulty of assessing quantitatively the soil-water content integrated over the entire root zone at a point of time renders these methods even more inaccurate for assessing rates of transpiration. Nevertheless, valuable information has been and can be obtained with these methods. The ease with which changes in tension with time can be followed, after the initial installation, makes these useful tools for indirectly exploring the distribution of roots and wetting fronts, the relative changes in soil tension in different levels of the soil profile (6) and for controlling the application of irrigation (19). Of " plant physiological " methods, the only method with any claim is that involving rapid weighing of excised leaves over short periods of time (17). This method has been used widely by Oppenheimer and his co-workers (33) and by Slatyer (52). Despite the great value of these investigations, the method must be regarded as providing only an approximate estimate of absolute values of water loss, because of the sampling errors arising from large differences between different leaves in both initial rates and during the period (3 – 5 min.) of measurement (14). Methods such as those involving cobalt chloride paper or diffusion into gelatine (51) do not in fact measure transpiration but rather some function of the stomatal conductance and the vapour pressure of the evaporating surface (27).

THE DETERMINATION OF VARIATIONS IN THE TRANSPIRATION RATE

It has long been recognised that from a crop, well supplied with water, variations in transpiration follow chiefly the variation in radiation, wind speed and vapour pressure. To these must be added the influence of differences in structure and roughness of the surface and behaviour of the stomata. If any precision is to be achieved, the interrelations between these factors and the complexity of the system must be expressed by a rational relationship. The relationship formulated by Penman (*loc. cit.*) achieves this ; the potential and even the actual transpiration can be estimated with varying degrees of precision depending on the extent and accuracy of the observations available. Thus from climatological data the potential transpiration of any area or region can be crudely estimated. Greater precision will be achieved for a particular site in a particular year by using current records for that site. Details of the use of this method in calculating the potential transpiration rate have been prepared by Pearl *et al.* (37). Variations in the transpiration rate are mainly determined by meteorological conditions, provided there is ample soil moisture. These are considerable, so there is little point in giving actual data for any locality. However, as a crude estimate, transpiration in southern England varies from about 2 inches per month (1 – 2 mm./day) in spring and autumn to about 4 inches (3 – 5 mm./day) in June and July.

Knowledge of the cumulative water loss from transpiration allows the calculation of the amount of water in the soil at any time. It is necessary to know the relationship between growth and soil water in order to infer the consequences of transpiration on growth under any set of conditions or to offset this effect through irrigation. Contrary to the earlier belief that all the water in the soil between field capacity and wilting point is equally available to plants (64), it now seems certain that growth, though not necessarily transpiration, is reduced when the soil water is reduced to a small extent below field capacity (46), (18), (54), (55). If all the roots are submitted to an equal tension, then growth is reduced if this tension increases beyond about 1 atm. (65), (66). Growth of tomatoes is reduced when the tension at 15 cm. falls below 0·1 atm. whereas there is no effect on lettuce with a reduction at this depth to about one atm. (19). This results from the more active root growth of the lettuce plant. Makkink and van Heemst (25) have shown that there is a decrease in the transpiration of grass when the tension at 5 cm. falls below 0·1 atm. when the transpiration

rate is high ; further, the drier is the soil then the lower is the transpiration rate at which the actual rate departs from the potential rate. Slatyer (52), (53) has shown that the transpiration rate of groundnuts and cotton declines as soon as the soil moisture commences to be depleted but is maintained by grain sorghum, because of the larger root system, for a much longer period. Present estimates (37) of 3 inches for grass and 1–2 inches for shallow-rooted crops like beet as the water deficit at which growth is checked would appear from the above evidence to be unduly optimistic.

The relationship of transpiration and growth with soil water is still far from clear. Under field conditions this will depend on the influence of tension around any root, on the rate of absorption by that root and on the distribution of the root system. The latter shows well-known specific differences but the stage of growth is also involved. The rate of extension of the root system, the movement of water through unsaturated soil (57), and the intensity of transpiration are all concerned. Until the interrelations of these factors are more fully explored, any quantitative explanation of the influence of the soil-water deficit on either growth or transpiration can be no more than an inspired guess. Nevertheless, a much clearer picture would emerge from simple field determinations of the relationship between growth and the calculated soil-water deficit.

As suggested earlier, much greater precision could be achieved using the Penman relationship if more exact information on the transport equation (E_a) were available for each type and stage of crop and continuous records of the stomatal factor were made. Stomatal behaviour can be readily followed in the field by the injection method (50). The qualitative results so obtained may be converted to absolute units of conductance by calibration for each species with the resistance porometer of Gregory and Pearse (12) and using a derived relationship between diffusive and viscous conductance. With previously determined values of the transport equation for the stage and type of crop, determined values for cuticular conductance for the crop, and recorded values of stomatal conductance, together with measurements of the appropriate weather factors, the actual transpiration rate would then be measured under all conditions. Moreover, changes in stomatal behaviour would indicate the initiation of water stress in the plant.

This approach certainly appears to offer the simplest and most exact means for determining actual transpiration rates as it avoids the complicated issue of first determining some integrated value of the soil-water content and then relating this to the growth of the plant. The empirical relation between growth and soil-water deficit under field conditions still remains to be ascertained but a series of simple experiments in which growth rates are determined and transpiration rates estimated as above would readily supply the required information. Difficult issues such as the relationship between transpiration and soil tension (at one or more depths) or the direct measurement of soil-water content then become largely irrelevant.

BIBLIOGRAPHY

(1) Aitchison, G. D., Butler, P. F. and Gurr, C. G. 1951. Techniques associated with the use of gypsum block soil moisture meters. *Aust. J. appl. Sci.* **2**, 56–75.

(2) Bange, G. G. J. 1953. On the quantitative explanation of stomatal transpiration. *Acta bot. néerl.* **2**, 255–97.

(3) Black, J. N. 1956. The distribution of solar radiation over the earth's surface. *Arch. f. Met., Geophys., u. Bioklim.* **7B**, 165–89.

(4) ————, Bonython, C. W. and Prescott, J. A. 1954. Solar radiation and the duration of sunshine. *Quart. J. roy. met. Soc.* **80**, 231–5.

(5) Briggs, L. J. and Shantz, H. L. 1916. Daily transpiration during the normal growth period and its correlation with the weather. *J. agric. Res.* **7**, 155–213.

(6) Butler, P. F. and Prescott, J. A. 1955. Evapotranspiration from wheat and pasture in relation to available moisture. *Aust. J. agric. Res.* **6**, 52–61.

(7) Crafts, A. S., Currier, H. B. and Stocking, C. R. 1949. Water in the physiology of plants. Waltham, Mass., USA.: Chronica Botanica Co.

(8) Gasser, R. 1942. [Changes in the absorbing power of the cell at the threshold of plasmolysis brought about by hypo- and hyper-tonic solutions.] *Ber. schweiz. bot. Ges.* **52**, 47–110.

(9) Gäumann, E. 1942. [Transpiration in the plant. 1. Cuticular transpiration.] *Zeit. f. Bot.* **38**, 225–327.

(10) ————— and Jaag, O. 1935. [Investigations in plant transpiration.] *Ber. schweiz. bot. Ges.* **45**, 411–518.

(11) Gregory, F. G., Milthorpe, F. L., Pearse, H. L. and Spencer, H. J. 1950. Experimental studies of the factors controlling transpiration. 1. Apparatus and experimental technique. 2. The relation between transpiration rate and leaf water content. *J. exp. Bot.* **1**, 1–28.

(12) Heath, O. V. S. 1941. Experimental studies on the relation between carbon assimilation and stomatal movement. 2. The use of the resistance porometer in estimating stomatal aperture and diffusive resistance. Pt 1. A critical study of the resistance porometer. With an Appendix by H. L. Penman. *Ann. Bot., Lond. (N.S.)* **5**, 455–500.

(13) Holmes, J. W. 1956. Measuring soil water content and evaporation by the neutron scattering method. *Ned. J. agric. Sci.* **4**, 30–4.

(14) Hölzl, J. 1955. [Variation in transpiration values in different leaves of a plant and of plants of the same species in a plant population.] *Sitzungsber. Osterr. Akad. d. Wiss., Math-naturw. Kl.* **9**, 659–721.

(15) Homan, C., Young, T. F. and Shull, C. A. 1934. Evaporation in its thermodynamic relation to

the cohesion theory and to imbibitional and osmotic pressures of cell constituents. *Pl. Physiol.* **9,** 653–61.

(16) Honert, T. H. van den. 1948. Water transport in plants as a catenary process. *Disc. Farad. Soc.* **3,** 146–53.

(17) Huber, B. 1923. [Transpiration at different stem-heights. 1.] *Zeit. f. Bot.* **15,** 465–601.

(18) Hudson, J. P. 1957. The study of plant responses to soil moisture. *Proc. Univ. Nottingham 4th Easter Sch. Agric. Sci.* 113–28. London; Butterworths.

(19) ————, Salter, J. P. and Majmudar, A. M. 1955. Water regimes in irrigation research. *Rep. 14th Internat. Hort. Congr.* 497–505.

(20) Hygen, G. 1951. Studies in plant transpiration. 1. *Physiol. Plant.* **4,** 57–183.

(21) ———— 1953. Studies in plant transpiration 2. *Ibid.* **6,** 106–33.

(22) ———— 1954. The effect of wind on stomatal and cuticular transpiration. *Nytt Mag. Bot.* **3,** 83–94.

(23) Lewis, F. J. 1945. Physical conditions of the surface of the mesophyll cell walls of the leaf. *Nature, Lond.* **156,** 407–9.

(24) Magness, J. R., Degman, E. S. and Furr, J. R. 1935. Soil moisture and irrigation investigations in eastern apple orchards. *Tech. Bull. 491 U.S. Dep. Agric.*

(25) Makkink, C. F. and van Heemst, H. D. J. 1956. The actual evapotranspiration as a function of the potential evapotranspiration and the soil moisture tension. *Ned. J. agric. Sci.* **4,** 67–72.

(26) Martin, E. V. 1943. Studies of evaporation and transpiration under controlled conditions. *Publ. 550 Carnegie Inst. Wash.*

(27) Milthorpe, F. L. 1955. The significance of the measurement made by the cobalt chloride paper method. *J. exp. Bot.* **6,** 17–19.

(28) ———— and Spencer, E. J. 1957. Experimental studies of the factors controlling transpiration. 3. The interrelations between transpiration rate, stomatal movement, and leaf-water content. *J. exp. Bot.* **24,** 413–37.

(29) Morris, L. G., Neale, F. E. and Postlethwaite, J. D. 1957. The transpiration of glasshouse crops, and its relationship to the incoming solar radiation. *J. agric. Engng Res.* **2,** 111–22.

(30) Neale, F. E. 1956. Transpiration of glasshouse tomatoes, lettuce and carnations. *Ned. J. agric. Sci.* **4,** 48–56.

(31) Oppenheimer, H. R. 1947. Studies on the water balance of unirrigated woody plants. *Palest. J. Bot., Rehovot Ser.* **6,** 63–77.

(32) ———— 1951. Summer drought and water balance of plants growing in the Near East. *J. Ecol.* **39,** 356–62.

(33) ———— 1953. Water requirement and irrigation of citrus groves. *Rep. 13th Internat. Hort. Congr.* 1267–74.

(34) Pasquill, F. 1949a. Some estimates of the amount and diurnal variation of evaporation from a clayland pasture in fair spring weather. *Quart. J. roy. met. Soc.* **75,** 249–56.

(35) ———— 1949b. Eddy diffusion of water vapour and heat near the ground. *Proc. roy. Soc.* **198A,** 116–40.

(36) ———— 1950. Some further considerations of the measurement and indirect evaluation of natural evaporation. *Quart. J. roy. met. Soc.* **76,** 287–301.

(37) Pearl, R. T. [Ed.] 1954. The calculation of irrigation need. *Tech. Bull. 4 Minist. Agric., Fish., Fd, Engl. and Wales.*

(38) Penman, H. L. 1948. Natural evaporation from open water, bare soil and grass. *Proc. roy. Soc.* **193A,** 120–46.

(39) ———— 1952. Experiments on irrigation of sugar beet. *J. agric. Sci.* **42,** 286–92.

(40) ———— 1953. The physical bases of irrigation control. *Rep. 13th Internat. Hort. Congr.* 913–24.

(41) ———— 1956. Evaporation : an introductory survey. *Ned. J. agric. Sci.* **4,** 9–29.

(42) ———— and Schofield, R. K. 1951. Some physical aspects of assimilation and transpiration. *Soc. Exp. Biol. Symp.* **5,** 115–29.

(43) Powell, R. W. 1940. Further experiments on the evaporation of water from saturated surfaces. *Trans. Inst. chem. Eng.* **18,** 36–55.

(44) ———— and Griffiths, E. 1935. The evaporation of water from plane and cylindrical surfaces. *Ibid* **13,** 175–98.

(45) Prescott, J. A. 1949. A climatic index for the leaching factor in soil formation. *J. Soil Sci.* **1,** 9–19.

(46) Richards, L. A. and Wadleigh, C. H. 1952. Soil water and plant growth. [Contained in] Soil physical conditions and plant growth. Ed. by B. T. Shaw. New York : Academic Press, 73–249.

(47) Rider, N. E. 1954a. Evaporation from an oat field. *Quart. J. roy. met. Soc.* **80,** 198–211.

(48) ———— 1954b. Eddy diffusion of momentum, water vapour, and heat near the ground. *Phil. Trans. roy. Soc.* **246A,** 481–501.

(49) ———— 1957. Water losses from various land surfaces. *Quart. J. roy. met. Soc.* **83,** 181–93

(50) Schorn, M. 1930. [Experiments in the application of the alcohol-fixation method and infiltration method for measuring the width of the stomatal opening.] *Jahrb. f. wiss. Bot.* **71,** 783–840.

(51) Sivadjian, J. 1953. [Plant transpiration, its economic importance and study by the hygro-photographic method.] *Oléagineux* **8,** 367–70.

(52) Slatyer, R. O. 1955. Studies of the water relations of crop plants grown under natural rainfall in Northern Australia. *Aust. J. agric. Res.* **6,** 365–77.

(53) ———— 1956. Evapotranspiration in relation to soil moisture. *Ned. J. agric. Sci.* **4,** 73–6.

(54) ———— 1957a. The influence of progressive increases in total soil moisture stress on transpiration, growth and internal water relationships of plants. *Aust. J. biol. Sci.* **10,** 320–36.

(55) ———— 1957b. The significance of the permanent wilting percentage in studies of plant and soil water relations. *Bot. Rev.* **23,** 585–636.

(56) Spanner, D. C. 1952. The suction potential of plant cells, and some related topics. *Ann. Bot., Lond., (N.S.)* **16,** 379–407.

(57) Staple, W. J. 1956. Evaporation from soil and vegetation. *Ned. J. agric. Sci.* **4,** 39–42.

(58) Sutton, O. G. 1953. Micrometeorology. London: McGraw Hill Publ. Co.

(59) Swinbank, W. C. 1951. The measurement of vertical transfer of heat and water vapour by eddies in the lower atmosphere. *J. Meteorol.* **8,** 135–45.

(60) Taylor, R. J. and Dyer, A. J. 1958. An instrument for measuring evaporation from natural surfaces. *Nature, Lond.* **181,** 408–9.

(61) Thornthwaite, C. W. 1948. An approach towards a rational classification of climate. *Geogr. Rev.* **38,** 55–94.

(62) ———— and Holzman, B. 1942. Measurement of evaporation from land and water surfaces. *Tech. Bull. 817 U.S. Dep. Agric.*

(63) Ursprung, A. 1925. [The penetration of water

and other fluids into inter-cellular spaces.] *Beih. Bot. Zentralb.* **41**, 15–40.

(64) VEIHMEYER, F. J. and HENDERSON, A. H. 1955. Does transpiration decrease as the soil moisture decreases ? *Trans. Amer. geophys. Un.* **36**, 425–48.

(65) WADLEIGH, C. H. 1955. Soil moisture in relation to plant growth. [Contained in] Water, Yearbook of Agriculture for 1955. By U.S. Dep. Agric. 358–61.

(66) ———— and AYERS, A. D. 1945. Growth and biochemical composition of bean plants as conditioned by soil moisture tension and salt concentration. *Pl. Physiol.* **20**, 106–32.

(67) WILLIAMS, W. T. and AMER, F. A. 1957. Transpiration from wilting leaves. *J. exp. Bot.* **8**, 1–19.

(68) WRENGER, M. 1935. [The effect of wind on the transpiration of the plant.] *Zeitschr. f. Bot.* **29**, 257–320.

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FIELD CROPS

CEREALS

WHEAT

See also Abs. 100, 148, 151, 153, 154, 158, 161, 351, 358, 380, 421, 422, 425, 435, 436, 441, 442, 449, 452, 465, 494

1 SALAZAR, V. Q. J. Cultivo de trigo en secano. [**Wheat-growing without irrigation (in Spain).**] *Hojas divulg. 6–58 H Minist. Agric. Spain* 1958, pp. 16, illus.

2 MOTWANI, V. T. **A non-traditional way of sowing wheat.** *Farmer, Bombay* 1958, **9**, No. 6, 17–18. [Agric. Res. Farm, Halvad, Saurashtra]

In Halvad Taluka, now irrigated from the Brahmani Dam, sowing wheat in November resulted in higher yields than the local practice of sowing within a 10-day period in October. The rust-resistant variety NP710 was sown.—D.B.

3 NISHIMURA, S. and ARATA, H. **Studies on the soiling of winter cereal crops. 2. The effect of clipping on the grain yield of wheat.** [Japanese] *Bull. Shikoku Agric. Exp. Sta.* 1957, **3**, 1–20, bibl. 25, illus., English summary.

When winter wheat was sown at the correct time for grain production, and clipped (for forage) above the growing point, the reduction in grain yield was 10–15%, and this reduction was approximately the same, whatever the time of clipping. Norin 52 produced higher grain yields than Seabreeze (American), but both produced the same amount of forage. Dense sowing increased forage yield and markedly decreased grain yield. Heavy applications of fertilizer increased forage yield and its crude-protein content, while grain yields remained constant. Clipping prevented lodging which resulted from early sowing and heavy fertilization. Light sowing, heavy applications of fertilizer, and clipping above the growing point are the practices recommended for producing grain and forage on small farms in the warm parts of Japan. F. Eng. s.—D.B.

4 HUTTER, W. Contribution à l'étude du sous-solage. [**Contribution to the study of subsoiling.**] *Bull. 71 Soc. Agric. Maroc* [n.d.], 29–46. [Received March, 1958]

From trials in Morocco it is concluded that in a 2-year rotation without irrigation, subsoiling done 12–16 months before sowing wheat has no effect on wheat yields. It is, however, admitted that this practice could influence favourably the yields of wheat and other crops under wet conditions.—E.B.O.

5 FOTI, S. Consociazione e concimazione in alcune razze di *Triticum durum* Desf. [**Consociation and manuring of some varieties of *T. durum*.**] *Agricoltura ital.* 1957, **57**, No. 12, 500–15, bibl. 13. [Ist. Agron., Univ. Catania, Italy]

In 2-year trials carried out with 3 durum wheat varieties in 2 localities in Sicily, there was no difference in yields from growing the varieties in consociation or alone, while manuring increased yields considerably.—E.B.O.

6 WHITESIDE, A. G. O. and GFELLER, F. **Spring and winter wheat for eastern Canada.** *Publ. 871 Canada Dep. Agric.* [Revised] 1958, pp. 15, illus.

Recommended varieties of spring- and winter-wheat for the eastern provinces of Canada are given, with notes on prevalent diseases and their control.—R.B.

7 HEYNE, E. G. **Registration of improved wheat varieties, XXI.** *Agron. J.* 1958, **50**, No. 7, 396–9, bibl. 13.

The following varieties are described : Atlas 50, Atlas 66, Dual, Knox, LaPorte, Vermillion, Vigo, Bledsoe, Chancellor, Butler and Seneca.—A.M.H.

8 PIMENTEL, H. Variedades de trigo e épocas de plantio aconselháveis no Estado do Paraná. [**Wheat varieties and sowing dates recommended for Parana State (Brazil).**] *Circ. 5 Inst. agron. Sul* 1956, pp. 27, bibl. 10, illus., English summary. [Received Feb., 1958]

The wheat varieties Trintecinco, P.G.1, Alegrete, Colônias, Combate (all late), Trapeano and Frontana (both early) are recommended for the south-west areas, and Bandeirantes and Frontana (both early) for the north. Their yields are given. In the south-west, late varieties yield best when sown from mid June to early July, and early varieties when sown from end June to mid July. In the north the early varieties should be sown during 15–30 April. F.s.—E.B.O.

9 THORPE, H. C. and DIXON, G. E. **Release of new cereal varieties—1958.** *E. Afr. agric. J.* 1958, **24**, No. 1, 15, bibl. 1. [Pl. Breed. Sta., Njoro, Kenya]

Information is given on the following cereal varieties : wheat, Cross 339, 362.B.1.A.2., 367.-AR.3.B.2.B., 367.BR.1.D.4.B., H.462.A-3-4-2.3., R.L.2150/A. and Sabanero/1. ; barley, Research (Mid-season).—A.M.H.

10 SIKKA, S. M. and SRINIVASAN, V. K. **Rust-resistant N.P. 200 wheat is a high-yielder too !** *Indian Fmr* 1958, **8**, No. 5, 9–10. [Wheat Breed. Sub. Sta., Wellington, Nilgiri Hills]

NP 200 far excels the local wheat (both *Triticum dicoccum*) in yield, rust resistance, 1000-grain weight, nutritive value, and grain to husk ratio. It is recommended for cultivation in the Nilgiri and Palni hills.—D.B.

11 SINGH, GURSHAM and others. **A new wheat makes its mark in the Punjab.** *Indian Fmg* 1958, **8**, No. 5, 6–7, illus. [Wheat Breed. Sub-Sta., Gurdaspur, Punjab]

C286, a new bearded wheat, has been tested for 5 years and, compared with C250 (cultivated at present), has given higher yields, whether sown early or late, with or without irrigation, has greater rust resistance and matures earlier. It lodges when grown in rich soils. C286 is suitable for submontane regions and should be particularly satisfactory where wheat must be sown late, after harvesting a monsoon crop such as rice. It should also do well under late-sown irrigated conditions in the rest of the Punjab where wheat follows cotton and other monsoon crops.—D.B.

12 SYMES, K. J. **Identification of wheat varieties from their grain characters.** *Agric. Gaz. N.S.W.* 1958, **69**, No. 4, 178–85, illus. [N.S.W. Agric. Res. Inst., Wagga Wagga]

The characters and technique used for distinguishing wheat grains of different varieties are described.—A.M.H.

13 SYMES, K. J. **Identification of wheat varieties from their grain characters.** [Contd] *Agric. Gaz. N.S.W.* 1958, **69**, No. 5, 265–76, illus. [N.S.W. Agric. Res. Inst., Wagga Wagga]

A key, based on grain characters, is given for identifying 18 varieties commonly grown in N.S.W. and Victoria. These varieties are described and their grains illustrated. [See previous Abs.]—A.M.H.

14 ANDERLINI, R. and FAVERO, A. Principi e norme per la produzione delle sementi. [**Principles and rules for seed production.**] *Quad. I Ente naz. Sementi elette* 1957, pp. 25, illus. [Milano, Italy]

General information is given on seed production, especially with regard to wheat, rice, hybrid maize and seed-potato tubers.—E.B.O.

15 CHU, S. M. and others. **The proper use of arsenic for treating seed wheat.** [Chinese] *Acta phytopath. sinica* 1957, **3**, No. 2, 177–82, bibl. 11, English summary. [E. China Agric. Res. Inst., Nanking]

This is a study of the safe dose of As_2O_3 for wheat seeds under different conditions of storage and different moisture contents and temperatures of the soil. Seeds can be disinfected with as little as 0·005% As_2O_3, if they are subsequently stored for 2–3 months before sowing. With this dose, the seeds retain viability regardless of the moisture content and temperature of storage-air or of the soil in which they are sown. A higher dose, 0·01% As_2O_3, requires a lower relative humidity of air during storage and a soil moisture content which will induce immediate germination. Seeds can be safely stored or sown after a dose of 0·05% As_2O_3 if the air- or soil-temperature is below 10°C. F. Eng. s.–D.B.

16 NIEMANN, E. Kaltwasserquellung und anaerobes Benetzungsverfahren zur Flugbrandbekämpfung bei Weizen. [**Cold water treatment and the anaerobic moisture-treatment for controlling loose smut on wheat.**] *Nachr.Bl. dtsch. Pfl.SchDienst.* 1958, **10**, No. 2, 26–30, bibl. 15. [Biol. Bundesanst, Kiel-Kitzberg, W. Germany]

Ustilago tritici on wheat was satisfactorily controlled by the anaerobic method of keeping moist grains in a closed vessel. The period required for treatment ranged between 975 hr. at 2·5°C. and 4 hr. at 44·5°C. The loss in germination energy also decreased as the temperature at which the grains were maintained increased to 44·5°C. The soaking method was less successful, though results were better at the higher than at the lower temperature within the range 3·8–47°C.—D.B.

17 SINGH, ARJAN and SINGH BEDI, KISHAN. **Loose smut and earcockle.** *Indian Fmg* 1958, **8**, No. 3, 6–10, illus.

Methods suitable for the Punjab for controlling these wheat diseases are described. They involve no outlay for the farmer. *Ustilago tritici* is controlled by soaking the grain for 4 hr. in water in sunlight. This is immediately followed by drying the grain on sheeting in sunlight, allowing 16 sq.yd. for spreading 1 maund (82·3 lb.) of grain. The eelworm galls (*Anguillulina tritici*) are separated from wheat grain by flotation, skimmed off and burnt. The grain is then dried. Treatments for both loose smut and ear cockle are carried out in May and June.—D.B.

18 FALANGHE, O. O combate às pragas do trigo proporciona melhores colheitas. [**The control of wheat pests results in better crops.**] *Biológico, S. Paulo* 1958, **24**, No. 3, 42–5, bibl. 10.

In a trial in São Paulo State, Brazil, to control insect pests on wheat, the best treatment, which gave yields significantly higher than those of the controls, was a mixture of chlorinated camphene (20%) and parathion (0·4%) applied as dust at the rate of 13 kg./ha. supplemented, on the same day, by a low-volume spray of metasystox (50%) at 0·25% active principle.—E.B.O.

19 CHEVALIER, R. Échaudage chez les blés tendres et poids de mille grains. [**Shrivel-**

ing of soft wheats, and 1000-grain weight.] *Ann. Amélior. Pl., Paris* 1957, **7**, No. 4, 413–30, bibl. 3, English, German and Russian summaries. [Sta. Amélior. Pl., Montpellier, France]

In the collection of soft wheats grown at Montpellier, the 1000-grain weights have been determined since 1947 and the degree of shrivelling since 1949. These data are shown in a table in which the varieties are arranged in order of increasing earliness of flowering. The value of the method of investigation so far adopted is discussed. It is thought that the study of shrivelling in wheat must be integrated in regional varietal trials with notes on local climatic conditions. Most of the wheats resistant, or little susceptible, to shrivelling are early, but some are medium-early. —E.B.O.

20 Moja, A. Sull'assorbimento dei nitrati di sodio e di calcio in plantule di frumento (*Triticum vulgare* Vill.). [**On the absorption of sodium- and calcium-nitrates by seedlings of wheat** (*T. vulgare*).] *Ann. Sper. agr.* 1958, **12**, No. 3, 983–99, bibl. 21, English summary. [Ist. Agron., Univ. Milano, Italy]

The results from an investigation with wheat seedlings grown in Petri dishes and fed with aqueous solutions of sodium- or calcium-nitrate indicated that the nitric anion from sodium nitrate is absorbed more rapidly both in seedlings kept under natural light and in darkness, and that it accumulates in greater quantity in the plants than the nitric anion from calcium nitrate.—E.B.O.

21 Shaw, M. and others. **Some effects of indoleacetic acid and maleic hydrazide on the respiration and flowering of wheat.** *Canad. J. Bot.* 1958, **36**, No. 2, 233–7, bibl. 10, illus. [Univ. Saskatchewan, Saskatoon]

22 Brown, J. C. and others. **Carbohydrate and organic acid metabolism with C^{14} distribution affected by copper in Thatcher wheat.** *Pl. Physiol.* 1958, **33**, No. 1, 38–42, bibl. 13, illus. [U.S. Dep. Agric., Beltsville, Maryland]

23 Šan'-Čen', Sun' and others. [**The significance of light for growth and development in wheat and rye.**] [Chinese] *Acta agric. sinica* 1958, **9**, No. 1, 36–46, bibl. 22, illus., Russian summary. [N.E. Agric. Inst.]

Before the plants are vernalized, light has a significant positive influence on the growth of wheat and rye. Growth, leaf width, dry and fresh weights in unvernalized plants subjected to 18°C. under continuous light were greater than when the plants were grown in 8-hr. day. The significance of these facts is discussed. F. Russ. s. —M.H.

24 Žo-Fu, Du. [**Changes in characteristics of the ear in spring wheat under the influence of short day.**] [Chinese] *Acta agric. sinica* 1958, **9**, No. 1, 1–13, bibl. 14, illus., Russian summary.

From tests in which spring-wheat sowings were made at 8 dates (intervals of 2 or 3 days between each) and kept in a glasshouse under continuous light [duration not stated] before being transferred to 10-hr. short day in the open for 39 days, it is shown that the degree to which ear characters (number of spikelets, branching, multiple germ, etc.) are affected by short day depends on the length of time which elapses between seedling emergence and the onset of short-day periods. It is claimed that the character and degree of the ear alterations depend on the extent of the apical differentiation and the qualitative condition of the apical cells at the time when the plants are subjected to short day. F. Russ. s.—M.H.

25 Beddows, A. R. **Shoot morphology in various Gramineae.** *Welsh Pl. Breed. Sta. Rep. 1950–6*, Aberystwyth, 1958, 33, bibl. in text. [Welsh Pl. Breed. Sta., Aberystwyth]

In Squarehead's Master wheat and certain other Gramineae, there was a characteristic pattern of leaf size along the shoot, with leaf length increasing to a peak value and then decreasing. Inflorescence initiation at the apex occurred when the longest leaf was appearing. Leaf length was related to cell length rather than cell number.—A.M.H.

26 Pohlendt, Gisela. Anatomische Untersuchungen über die Brüchigkeit der hexaploiden Weizen unter Berücksichtigung der iranischen Spelzfunde. [**Anatomical studies of the brittleness of hexaploid wheats with reference to the collection of spelt wheats from Iran.**] *Z. PflZücht.* 1958, **39**, No. 3, 339–47, bibl. 5, illus. [Techn. Hochsch. Hannover, W. Germany]

The cell structures which cause brittleness of the spikelets of *Triticum spelta*, *T. macha* (from Turkey) and *T. aestivum* are described. Wheats from Iran are compared with the above species as regards these structures.—D.B.

27 Strusi, A. Contributo alla conoscenza della costituzione glutinica del frumento duro e del frumento tenero. [**Contribution to the knowledge of the gluten of durum wheat** (*Triticum durum*) **and soft wheat** (*T. vulgare*).] *Ann. Sper. agr.* 1958, **12**, No. 3, 833–53, bibl. 26, illus., English summary. [Sta. Agr. Sper., Bari, Italy]

28 Ridyard, H. N. **The presence in wheat gluten of a substance resembling thiamine (Vitamin B_1).** *Chem. and Industr.* 1958, No. 37, 1197–8, bibl. 7, illus. [Res. Assoc. Brit. Flour Mil., Cereals Res. Sta., St. Albans]

29 Lawrence, J. M. and others. **Lysine content of wheat varieties, species, and related genera.** *Cereal Chem.* 1958, **35**, No. 3, 169–78, bibl. 13. [Washington Agric. Exp. Sta., Pullman]

Microbiological lysine assays using *Leuconostoc mesenteroides* were made on 230 varieties of wheat and 46 related species, genera or crosses. The lysine content of the protein (N × 5·7) was 2·46–3·84% in wheat, 2·21–3·50% in other *Triticum* spp. and 2·80–3·98% in related genera. No significant differences were found between red and white spring- or winter-wheats. No relationship was found between lysine- and protein-contents as the latter rose above 13·5% but, below this level, a significant inverse correlation existed. Neither year of growth nor growing site affected lysine content except when protein levels varied, but varietal differences existed which suggest that lysine levels could be raised by breeding.—M.H.F.

30 Doroganevskaja, E. A. **Zonality of protein contents in wheat.** *Izv. Akad. Nauk. SSSR (Bull. Acad. Sci. USSR) Geogr. Ser.* 1958, No. 5, 21–34, bibl. 25, illus. [Geogr. Inst., Acad. Sci. USSR]

The subject is reviewed from the following aspects : geographical change in conditions for the vegetative period of plants as one of the causes of zonal variation in plant composition ; biological relations of the wheat plant with temperature and moisture as one of the causes of changes in protein content of the grain grown in different geographical areas ; and the significance of the chemical composition of the plant as affected by different zones.—M.H.

31 Philipp, Lieselotte. Messung des Kornausfalles bei Weizen mit der Ährenzentrifuge. [**Measuring grain-shedding with an ear centrifuge.**] *Z. Acker- u. PflBau* 1958, **106**, No. 2, 153–72, bibl. 6, English summary. [Inst. PflBau u. PflZücht., Landw. Hochsch. Hohenheim, Stuttgart, W. Germany]

Using an ear centrifuge, the power required to force grains from the ears of 24 German winter-wheat varieties was determined. This power was correlated with certain genetic factors such as length of ear and weight of grain. The results showed that German winter-wheat varieties can be classified according to their ear-shedding properties. This classification agreed with observations. Directions are given for determining ear-shedding properties by the centrifuge.—D.B.

32 Schachl, M. Ergebnisse eines Qualitätsdüngungsversuches zu Winterweizen. [**Results of an experiment in manuring winter wheat for quality.**] *Bodenkultur* 1958, **10**, No. 1, 48–52. [Landw.-chem. Bundesversuchsanst., Linz, Austria]

The heavy manuring of 8 winter-wheat varieties in 1955 is discussed as it affected yield, 1000-grain- and hectolitre-weight, crude-protein content, P_2O_5 content, ash, baking quality etc. Results are tabulated.—G.M.R.

33 Russell, G. C. and others. **The effect of nitrogen and phosphorus fertilizers on the yield and protein content of spring wheat grown on stubble fields in southern Alberta.** *Canad. J. Pl. Sci.* 1958, **38**, No. 2, 139–44, bibl. 19.

N and P fertilizers were applied to hard red wheat grown on stubble lands at 3 places in Alberta for 2 seasons. In the first year, yields at all centres were significantly increased by N and were further augmented by P at 2 of these centres. In the second year, significant yield increases were recorded at 2 of the 3 centres following N applications but at only one location did P improve the yield significantly. In both years, N significantly increased grain protein at 2 centres. P significantly reduced the effect of N on grain protein at one centre in one year but exerted no consistent effect in the other trials. When moisture is adequate, improved wheat yields can be expected from N fertilizers, but more than 40 lb. N/ac., and at least 80 lb./ac. in some cases, were needed before increased grain protein could be anticipated. F. s. —M.H.F.

34 Fernández, G. R. and Laird, R. J. Efectos de la humedad del suelo y de la fertilización con nitrógeno sobre el rendimiento y la calidad del trigo. [**Effects of soil moisture and N manuring on yield and quality of wheat.**] *Fol. tec. 27 Sec. Agric. Ganad., Méx.* 1958, pp. 128, bibl. 62, illus., English summary.

An account is given of 2 wheat trials carried out in 2 localities at the La Cal Grande Agricultural Experimental Station, Guanajuato, Mexico, in 1955–6. In trial (1) the soil was fallowed during the previous summer, and in trial (2) wheat was sown after a crop of Hubam clover [*Melilotus alba* var. *annua*] had been ploughed-under. The main results were : (a) In trial 1 the application of 150 kg. N/ha. increased grain yields from 0·68 to 4·46 metric tons per ha. in the optimal soil moisture treatment, and from 0·65 to 2·41 tons/ha. in the driest treatment ; (b) in trial 2 the application of 50 kg. N/ha. increased grain yields from 3·3 to 4 tons/ha. in the optimal soil moisture treatment ; (c) the protein content of the wheat grain was lowest in the wet treatments and highest in the dry treatments ; (d) 6 irrigations with intervals varying from 34 days in January to 14 days in April were necessary to obtain maximum yields in trial 1 ; 8 irrigations with intervals varying from 24 days in January to 12 days in April were necessary in trial 2. F. s.—E.B.O.

35 Horlacher, H. **Science and practice in the manuring of wheat.** ***Triticum aestivum, T. durum, T. turgidum.*** *Green Bull.* 1957, No. 5, 32, bibl. 73, illus.

For the benefit of the wheat grower a review is given of the following aspects of the subject : the importance of the individual major nutrients and trace elements ; the effect of manuring on yield, quality of grain, resistance to frost, drought, pests and diseases ; some results of experiments in India, Italy, USA, and Formosa.—D.B.

36 Arvizu, R. Z. and Laird, R. J. Fertilización del trigo en el Valle del Yaqui. [**Wheat manuring in the Yaqui Valley (Mexico).**] *Fol. tec. 26 Sec. Agric. Ganad., Méx.* 1958, pp. 45, bibl. 25, illus., English summary.

Plot trials were carried out in different regions in the Yaqui Valley, in 1955–6, to study the response to N, P and K of wheat grown after wheat, cotton or *Sesbania* sp. Preliminary recommendations are made for each region.—E.B.O.

37 Convegno sulla Concimazione Azotata nell'Italia Meridionale e nelle Isole. [**Proceedings of the Meeting on Nitrogen Manuring in Southern Italy and the Italian Islands.**] Bari, 1957, pp. 406, bibl. at the end of papers, illus.

This publication consists of papers presented to this meeting, which was convoked by the Department of Agriculture of Bari University and other bodies. They are concerned with the N manuring of wheat, oats and sugar-beet, amongst other crops.—E.B.O.

38 Letelier, A. E. Interacción de nitrógeno y fósforo en trigo. [**Interaction of N and P on wheat.**] *Agricultura téc., Santiago* 1957, **17**, No. 1, 5–15, bibl. 2, English summary.

Trials to study the interaction of N and P on wheat were carried out in Chile in the area between Santiago and Osorno, in 1952–3, and in the Plan Chillán, in 1954–5. Although there were many variations between localities and years, some general trends were observed. The effect of N on wheat yields decreased from north to south ; it increased, in many trials, with dressings up to 96 kg. N/ha. and, in some cases, up to 128 kg. N/ha. The effect of P, important mainly in the area between Bío-Bío and Malleco, was far from reaching its maximum level with 160 kg. P_2O_5/ha., which was the maximum rate used in these trials. There was generally a positive interaction between N and P, especially in Cauquenes.—E.B.O.

39 Linser, H. and Primost, E. Zur Frage der Wirtschaftlichkeit verschieden hoher Stickstoffgaben in Getreidebau. [**The profitability of different amounts of nitrogen in cereal-growing.**] *Bodenkultur* 1958, **10**, No. 1, 53–70, bibl. 5. [Landw. Versuchsanst. Steyr, Österr. Stickstoffwerke, Linz, Austria]

An account is given of trials with winter wheat (1951–6) and rye (1954–6). The optimal dosage was found to be 400 kg. N per ha. (in 2 applications) for wheat, and 600 kg. N per ha. (in 3 applications) for rye.—G.M.R.

40 Gadd, L. Kvicksilverbetningens inverkan på lagringsdugighten hos vårvete. **The influence of mercury-compound dressings on the storage capacity of spring wheat.** *Medd. Frökontrollanst., Stockh.* 1958, No. 33, 31–59, English summary.

In trials during 1954-7, 100-kg. lots of combine-harvested spring-wheat seed were left untreated or treated as follows : (a) panogen liquid at normal rate, (b) panogen at double the normal rate, (c) betoxin T.D. dust (containing organic Hg + TMTD) at normal rate, (d) betoxin T.D. at double the normal rate. The treated seed was stored in bags in warehouses at Svalöf in S. Sweden, Norrköping in E.-central Sweden and at Mölndal, near Göteborg in W. Sweden, three locations which represent different climatic conditions for storage. The seed was treated in October of each year and determinations of moisture content and germination were made at the end of successive 2-month periods, in most cases over a 6-month period, but over a 10-month period in some cases. The moisture content of the seed remained virtually constant from late autumn to early summer, irrespective of the original moisture content, year, or place of storage. The increased storage temperature and drier air during summer resulted in rapid drying of the seed. Germination remained relatively unaltered in untreated control samples and samples treated with (a), (c) and (d). Samples subjected to treatment (b) showed consistent reduction in germination and increases in sprout deformities. Most of the reduction in germination caused by treatment (b) appeared to occur during the first 2 months of storage and germination percentages thereafter remained relatively constant. There was evidence that treatment techniques with panogen needed improvement. Seed treated with panogen tended to show greater infestation with *Penicillium* spp. than untreated controls ; betoxin T.D. maintained the seed almost completely free from moulds. Poor germination following treatment (b) was closely correlated with the amount of seed-coat damage caused by mechanical harvesting.—P.J.B.

OATS

See also Abs. 148, 151, 158, 161, 351, 358, 365, 373, 416, 435, 438, 452

41 Kugler, W. F. and others. Descripción de variedades de avena cultivadas en Argentina. [**Description of oat varieties grown in**

Argentina.] *Publ. tec. 32 Esta. exp. Pergamino* 1957, pp. 49, bibl. 4, illus.

42 Toms, J. **Oat varieties differ in susceptibility to manganese deficiency.** *J. Dep. Agric. W. Aust.* 1958, **7**, No. 3, 325.

On 2 occasions Avon has been observed to be less susceptible to Mn deficiency than Dale.—A.M.H.

43 Walsh, T. and McDonnell, P. M. **The control of manganese deficiency in wheat and oats by the combined drilling of a manganated granulated compound fertilizer.** *J. Dep. Agric. Republ. Ire.* 1956–7, **53**, 44–52, bibl. 4. [Dep. Agric. Republ. Ire.]

Manganese sulphate at 14, 28 or 56 lb./ac. combine-drilled with 3 cwt. of a 4 : 10 : 8 NPK compound fertilizer per ac. was more effective in suppressing Mn-deficiency symptoms in wheat and oats than was spraying with 2% Mn SO_4 just before the appearance of deficiency symptoms. 14 lb. $MnSO_4$/ac. drilled gave better control of deficiency symptoms than did 112 lb./ac. broadcast. In one trial, Mn-deficiency symptoms were less when NPK, without added Mn, was combine-drilled than when it was broadcast.—A.M.H.

44 Forward, B. F. **Studies of germination in oats. 1. The problem of delayed germination. 2. Germination tests and field results.** *Proc. internat. Seed Test. Ass.* 1958, **23**, No. 1, 5–37, bibl. 41. [Univ. Toronto, Canada]

The problem of delayed germination in seed in general is reviewed, with notes on dormancy in samples of Canadian oats. From the results of germination tests on oats, it was apparent : (a) that a percentage of dormant seed can be germinated after a short period of dry storage, and (b) that holding dormant seed for 1 week at a low temperature in moist conditions is more effective in promoting germination than dry storage. In studies to elucidate the nature of seed dormancy in oats, a number of experiments was carried out. In trials with 2 samples of partially-dormant seed, pre-chilling, alone, resulted in almost complete germination. Removal of hulls, with or without pre-chilling, increased germination ; removal of hulls combined with pre-chilling resulted in 99% germination in both samples. Surrounding the seed with pure O_2 for 20 min. markedly increased germination. In trials in which the dormancy-breaking effect of atmospheres containing 59% or 51% O_2, was compared with pre-chilling, alone, the O_2 pressures in this range resulted in germination percentages almost identical with those following pre-chilling. This fact was considered of significance, in that it could mean that the comparatively tedious pre-chilling procedures currently used might be eliminated. Seed held in bags had a higher germination than that held in sealed jars ; vacuum treatment of the seed also increased germination. In trials in which non-dormant seed was germinated in atmospheres containing different CO_2 : O_2 ratios, germination decreased progressively as the ratios fell from 0·0 : 20·9 to 38·7 : 12·8. In further experiments on non-dormant seed, increasing the CO_2 : O_2 ratio by decreasing the proportion of O_2, only, had almost no effect on germination until the O_2 concentration was lowered to *c.* 2·7%. All these results were held to support the hypothesis that seed dormancy in oats was due to a high concentration of CO_2 in the seed. In further trials, studies were made of the correlation between germination percentages in the laboratory and in the field. There was a great variation in field germination, compared with that in the laboratory. The difference between numbers which emerged and those which reached maturity in the field was very small. Samples with a low germination in the laboratory tended to have a considerably higher germination in the field. In field trials with seed of different germinating capacities, that which had a germinating capacity of 34% still gave an average yield of 36·6 bu./ac., which did not differ greatly from the yield where seed with 100% germinating capacity was used. It was thought that these results indicated that it was worth investigating the possibility of reducing recommended sowing rates where seed with a high germination percentage was used.—P.J.B.

45 Ashton, W. M. and Williams, P. C. **The phosphorus compounds of oats. 1. The content of phytate phosphorus.** *J. Sci. Fd Agric.* 1958, **9**, No. 8, 505–11, bibl. 13. [Dep. Agric. Chem., Univ. Coll. Wales, Aberystwyth]

At panicle emergence and from then until the milk-ripe stage, oats contained no phytin ; this later increased gradually to reach 60% of the total P at maturity. The total P content increased with maturity. During germination, phytate P fell steadily and disappeared in about 2 weeks, while the content of inorganic P increased. Varieties of *Avena strigosa* and *A. strigosa* × *brevis* were significantly richer in phytate and total P than varieties of *A. sativa*, but there was no difference in the phytate P/total P ratio. The Ca and Mg contents of the grain are considered in relation to their presence in phytin. Some of the evidence suggests that the phytin of different cereals may differ in chemical composition.—A.M.H.

46 Frimmel, G. Die Bedeutung des Fettgehaltes bei der Beurteilung von Haferernten. **[The importance of fat content in judging oat crops.]** *Bodenkultur* 1958, **10**, No. 1, 41–7, bibl. 4. [Landw.-chem. Bundesversuchsant., Linz, Austria]

Fat formation in unhusked oat samples was found to depend more upon locality than upon variety, and the same finding held good for the

husk content of the different samples. A negative correlation between fat content and proportion of husk was determined. A further negative correlation was found to exist between yield and fat content. A less reliable connexion exists between fat content and grain size. Yield and proportion of husk were independent of one another.—G.M.R.

47 Griffiths, D. J. **Oats.** *Welsh Pl. Breed. Sta. Rep. 1950–6* Aberystwyth, 1958, 71–86, bibl. in text.

1. Winter hardiness, p. 74. In 1954 and '55, Grey Winter showed least frost injury and S172 and Powys (S226) were hardier than S147.

2. Agronomic investigations, pp. 78–9. Mixtures of 2 varieties yielded as much as, or more than, the higher-yielding component grown alone. Over 5 yr., the higher-tillering component gradually became dominant.

3. Variation in panicle and culm characters in relation to population density, pp. 84–6. In 1954, Milford (S225) yielded significantly more than Victory or Marvellous ; Maldwyn (S221) was the top yielder. In 1955, Victory yielded more than Maldwyn and Milford ; Marvellous yielded most. There were no significant yield differences between seed rates in 1954. In 1955, seed rates of 137 and 206 lb./ac. resulted in significantly higher yields than a seed rate of 69 lb./ac. In Maldwyn and Marvellous there was a tendency towards equalization of panicle numbers at the low and high seed-rates, brought about in Maldwyn by high tillering at the low rate, and in Marvellous by heavy mortality of tillers or plants at the high rate. The number of spikelets per panicle was significantly reduced at the high seed rate compared with the low. This reduction was related to the presence or absence of the spikelet-bearing whorls 4, 5 and 6 (counting from panicle apex), and the number of spikelets in whorl 6.—A.M.H.

48 Leask, D. M. R. **The 1956 oat crop.** *Econ. Rep. 49 Edinb. E. Scot. Coll. Agric.*, 1958, pp. 12.

This report deals with the cost of producing 62 oat crops under varying conditions on 42 farms in Scotland in 1956. The average cost per ac. of binder-harvested crops was *c.* £24, or 15s. 11d./cwt. grain. For combine-harvested crops, the average cost was *c.* £21/ac. or 13s. 6d./cwt. grain (15s. 9d./cwt. when no allowance for straw was made).—A.M.H.

RYE

See also Abs. 53, 151, 153, 154, 161, 394, 468

49 Andersen, T. Førsøg med rugsorter 1952–1955. [**Trials with rye varieties 1952-5.**] *Tidsskr. Planteavl* 1958, 324–36.

[See also *Fld Crop Abstr.* 11 : 953.] The trials reported were carried out at 10 locations in Denmark with 9 varieties. Mean grain yields of varieties tested in 1952–5 were headed by Petkus Zuchtgartengemisch with 38·7 hkg./ha., followed by Sejet Kærne with 38·3 hkg., Borris Perle and Petkus, both with 37·6 hkg., and Svalöf Kongs II elite 48 with 36·2 hkg. In trials during 1952–3 yields of Øtofte elite 1 and Svalöf Kongs II elite 46 were 37·2 and 35·7 hkg., and of Borris Perle elite 2/50 and Svalöf Kongs II elite 50 during 1954–5, 37·9 and 36·4 hkg./ha., respectively. Data are also given of grain and straw quality and straw yields, together with brief notes on each variety.—P.J.B.

50 Kugler, W. F. and others. Descripción de variedades de centeno cultivadas en Argentina. [**Description of rye varieties grown in Argentina.**] *Publ. tec. 34 Esta. exp. Pergamino* 1957, pp. 28, bibl. 4, illus.

51 Das, T. M. **The relation of auxin to floral initiation and extension growth in winter rye.** *Indian Agriculturist* 1958, **2**, No. 1, 14–28, bibl. 27. [Imp. Coll. Sci. Tech., London]

A method for plant-auxin assay, based on the quantitative relationship between auxin concentration and root growth of rye seedlings, has been developed. Auxin content of the apex, developing ear and elongating stem of Petkus winter rye in relation to vernalization and day length was studied. There was no appreciable change of auxin content in the apex either before or immediately after floral initiation. Irrespective of treatment and time from sowing, the amount of auxin in the plant is approximately the same at the same stage of floral development. The auxin content of the nodes and internodes of the stem was found to bear a clear relationship to elongation of the internodes. F. s.—D.B.

52 Selke, W. Die Leistung des zusätzlichen späten Stickstoffs zu Getreide in Abhängigkeit von Standortsfaktoren. [**Production from supplementary late applications of N to cereals in relation to habitat factors.**] *Z. landw. Vers. UntersuchW.* 1957, **3**, No. 1, 25–46, bibl. 10, Russian and English summaries. [Inst. Landw. Versuchs- u. Untersuchungswesen, Potsdam, E. Germany]

Of the cereals (winter rye, winter barley, winter wheat, spring barley, and oats) tested in numerous experiments, winter rye gave the greatest increase in grain yield following a supplementary late application (at ear emergence) of 40 kg.N/ha., in addition to the 40 kg. N/ha. basal manuring. The increase varied inversely with the soil number [an expression of soil value]. No advantage was gained when the 80 kg.N/ha. was given in 3 applications. F. Germ. s.—D.B.

BARLEY

See also Abs. 139, 148, 151, 153, 154, 158, 161, 210, 351, 358, 365, 380, 414, 422, 437, 438, 452

53 Wuth, E. Ergebnisse über Aussaatzeiten-

versuche mit Wintergerste und Winterroggen. [**Results of time-of-sowing trials with winter barley and winter rye.**] *Dtsch. Landw.* 1958, **9**, No. 9, 442–4, bibl. 6. [Inst. Landw. Versuchs- u. Untersuchungswesen, Jena, E. Germany]

For maximum yields of winter barley, sowing in early September is recommended for cultivation zones I, II, III and VI and mid-September for zones IV and V. This is 10 days earlier than the present custom. The recommended sowing dates for winter rye are the last 10 days of September in unfavourable situations, and the first 10 days of October in favourable ones. Yields fall steadily and markedly with lateness of sowing. Yields of winter rye are higher after potatoes than after cereals. The sowing date is largely determined by the preceding crop. When winter rye follows cereals, it should be sown a week earlier than when it follows potatoes.—D.B.

54 Ivins, J. D. **The production of barley for feeding.** *Rep. Nottingham Univ. Sch. Agric.* 1957, 54–6.

Barley (var. Herta) was grown during 1956 and '57 and subjected to the following treatments : sowing rates of 1·5 or 3 bu./ac., combined with 0 or 1 cwt. nitrochalk/ac. at tillering, or 2 cwt. nitrochalk at tillering + 1 cwt. at ear emergence. The yield increase caused by a sowing rate of 3, as opposed to 1·5 bu. was 2·9 cwt./ac. grain in 1956 and 2·1 cwt. in 1957. The response to 1 cwt. nitrochalk at tillering at the lower sowing rate was 2·4 and 2·9 cwt. in 1956 and '57 and at the higher sowing rate, 1·8 and 1·5 cwt./ac., respectively. The extra response to a second cwt. of nitrochalk at tillering + 1 cwt. at ear emergence was negligible at the lower sowing rate. The results indicated that the effects of low plant populations may be only partly compensated for by increased N treatments because, at the higher rates of treatment used, plant population became the limiting factor. The higher sowing rate used resulted in a more even crop in terms both of plant height and time of maturation.—P.J.B.

55 Westrate, W. and Grafius, J. E. **The effect of clipping on the yield of winter barley.** *Quart. Bull. Mich. agric. Exp. Sta.* 1958, **40**, No. 4, 882–3.

Removal of excessive top growth from rank-growing winter barley depressed grain yields significantly.—M.H.F.

56 Bendelow, V. M. **The effect of irrigation on yield and malting quality of barley in southern Alberta.** *Canad. J. Pl. Sci.* 1958, **38**, No. 2, 135–8. [Exp. Sub-Sta., Taber, Alberta]

Since information on the effects of irrigation on malting barley were lacking, comparisons were made over 3 years on the yield and malting quality of Montcalm barley, irrigated and non-irrigated, in two rotations in Alberta. Irrigation significantly increased grain yield and improved malting quality. It lowered grain-nitrogen content, increased malt-extract value and kernel weight but reduced the malt saccharifying activity—all significantly. Fertilizers improved yields but had no significant influence on malting quality.—M.H.F.

57 Wiebe, G. A. and Reid, D. A. **Comparative winter hardiness of barley varieties.** *Tech. Bull. 1176 U.S. Dep. Agric.* 1958, pp. 20.

The winterhardiness of 204 winter-barley varieties was tested over 20 yr. in 963 tests. Differential winter-killing occurred in 535 tests. The hardiest variety was Kearney, closely followed by Dicktoo. Among the 30 hardiest varieties, Kido (from Korea) was the only introduced variety. F. s. —R.B.

58 Edinburgh and East of Scotland College of Agriculture. **Spring barley variety trials, 1955-1957.** *Rur. Adv. Leafl. 42, Edinb. and E. Scot. Coll. Agric.* [n.d.], pp. 4.

There was little variation in grain yield amongst the 6 varieties tested. Maythorpe was the earliest, Provost and Proctor the latest, to ripen. Maythorpe and Beorna showed the greatest tendency to lodge. Proctor, Provost and Beorna were the most acceptable for malting and Maythorpe, Ymer and Bonus for milling. Varietal notes on the 6 varieties are given.—A.M.H.

59 Société d'Encouragement de la Culture des Orges de Brasserie et des Houblons en France. Rapports sur la campagne 1956. [**Report for the season 1956.**] [n.d.], pp. 73. [Received July, 1958]

1. Winter-barley trials, p. 12. The varieties Atlas, Ardennes and Hatif Bonté, which yielded 4172, 3514 and 3107 kg./ha., respectively, were frost-resistant.

2. Spring-barley trials at Maule, pp. 13–33. The variety Carlsberg II yielded best with 5183 kg. of grain per ha. but was third in industrial value, being preceded by Busser and Beka ; it took first place in a general classification.

3. Regional trials, pp. 37–8. Yields were the highest ever recorded, being more than 4000 kg./ha. almost everywhere, but the protein content was rather low. Of the varieties more widely grown, Beka had the highest extract content (81·1%) and the highest protein content (10·3%), on a dry-matter basis.

4. Barley quality in France in 1956, pp. 39–43. Of the varieties mostly grown, Busser had the highest 1000-grain weight (44·7 g.) and had 80·7% extract and 9·5% protein content ; Beka and Isaria had 10·7 and 10·8% protein content, respectively.—E.B.O.

60 Akman, A. V. and others. Ankara ekolojik sartlarinda yabanci biralik arpalar. [**Foreign brewing barleys grown in the ecological conditions of Ankara, Turkey.**] [Turkish] *Bull. 42 Minist. Agric., Inform. and Publ. Sect.* [1953], pp. 39, German summary pp. 29-39.

Trials were carried out in Ankara with Swedish, German, Spanish and English varieties of brewing barley. Yields, physical attributes and chemical composition were determined and compared with a local variety Tobak 157/37. When sown in spring, the foreign varieties lost their brewing qualities, because they had a high protein- and low starch-content. When sown in winter, results were much more favourable. It is concluded that environment is more important than variety in determining quality of brewing barleys. The trials will be continued. F. Germ. s.—D.B.

61 Kugler, W. F. and others. Descripción de variedades de cebada cultivadas en Argentina. [**Description of barley varieties grown in Argentina.**] *Publ. tec. 33 Esta. exp. Pergamino* 1957, pp. 44, bibl. 6, illus.

62 Nakagawa, M. and others. **A new hull-less barley variety. " Nakate-Hadaka."** [Japanese] *Bull. Div. Pl. Br. Cultiv., Tokai-Kinki Nat. Agric. Exp. Sta.* 1956, No. 3, 175–8, illus., English summary.

This variety has large ears and tillers well ; it gives high yields, is resistant to mildew [*Erysiphe graminis*] and ear scab [*Gibberella zeae*] and can tolerate acid soils and K- and Mn-deficiency. F. Eng. s.—D.B.

63 Obolensky, G. Recherches sur quelques stimulations fonctionnelles chez les plantes par les ultra-sons. [**Investigations on some functional stimulations in plants by ultrasonic treatment.**] *Rev. gén. Bot.* 1958, **65**, No. 771, 297–362, bibl. 129, illus.

The results from experiments showed that barley seeds, subjected to ultrasonic treatment, germinated and developed more rapidly than untreated seeds. The treatment also stimulated the activity of α-amylase and cellulase. F.s.—E.B.O.

64 Aspinall, D. **Competition between white persicaria and barley.** *Rep. Nottingham Univ. Sch. Agric.* 1957, 48–50.

Observations are made on competition between barley and *Polygonum lapathifolium* in the field, which showed that plants of the latter were suppressed more when surrounded by barley plants than by plants of its own species. The capacity of barley to compete successfully with *P. lapathifolium* until late in the season was mainly due to the greater seed size in barley, which enabled it to make better early growth.—P.J.B.

65 Watson, D. J. and others. **Physiological causes of differences in grain yield between varieties of barley.** *Ann. Bot., Lond.* 1958, **22**, No. 87, 321–52, bibl. 15. [Rothamsted Exp. Sta., Harpenden, Herts]

In a field experiment on barley with the high mean yield of 49 cwt. of grain per ac., the varieties Proctor and Herta produced 10–15% more grain than Plumage-Archer on plots that received no N fertilizer. When N was applied, the difference was increased to about 30% because the higher N supply caused Plumage-Archer to lodge and did not increase its yield, while Proctor and Herta remained standing. The three varieties did not differ in leaf-area index nor in net assimilation rate before ear emergence, so that all had the same total dry weight. After ear emergence, the leaf-area indices of Proctor and Plumage-Archer were nearly equal, but that of Herta was smaller. A pot experiment on plants with shaded ears confirmed that the dry matter contributed to grain yield by unit leaf area was nearly equal in all the varieties. The higher grain yield of Proctor and Herta compared with that of Plumage-Archer must therefore have come from additional photosynthesis in parts of the plant other than the leaves, i.e. in the ears themselves, but an attempt to demonstrate this directly in a pot experiment was unsuccessful. The sum of ear sizes (estimated from length and breadth measurements) per $m.^2$ in the field experiment was greater for Proctor and Herta than for Plumage-Archer. Also the distribution of dry matter between developing ears and shoots differed with variety, so that at ear emergence the dry weight of ears per $m.^2$ was greater in the two higher-yielding varieties. No differences in nutrient uptake that could account for the varietal differences in grain yield were found. The pot experiment showed that, on the average of all varieties, 26% of the dry matter in the grain at harvest originated from photosynthesis in the ears, including 10% from the awns ; 59% came from photosynthesis in the flag-leaf lamina and sheath and peduncle, and 15% from parts of the shoots below the flag leaf. F.s.—M.H.

66 Novickaja, Ju. E. [**The effect of pre-sowing treatment of seed in minor-element solutions on drought-resistance of plants.**] [Russian] *Trudy Bot. Inst. V.L. Komarova (Trudy Inst. bot., Acad. Sci., USSR)* 1958, Ser. 4, Exp. Bot., No. 12, 74–94, bibl. 36.

The object was to study the possibilities of increasing the resistance of plants to drought in the Stony Steppe [approx. 40° E. long., 52° N. lat.] where grain crops are used in rotations. From experiments with barley (var. Nutans 187), 3 replications, and proso millet [*Setaria italica*], 4 replications, the following are among the conclusions drawn : (1) pre-sowing hardening of both

crops by soaking seed in a solution of boric acid (1 g./9 l. water, equivalent to 10 g.H_3BO_3/200 kg. seed per ha.) resulted in better yields than hardening by Henkel's method of soaking seed in water and subsequent drying ; (2) pre-sowing hardening of barley seed in H_3BO_3 or manganese sulphate ($MnSO_4$) during 24 hr. was preferable to vernalizing the seed, the % increase in yields over the controls being 42, 25 and 13, respectively ; (3) a direct relationship was shown to exist between drought resistance and oxidation-reduction processes in the plants.—M.H.

67 Hanf, M. Reaktion der vegetativen Teile von Getreide auf Behandlung mit Wuchsstoffen. [**Reactions of the vegetative organs of cereals to treatment with growth substances.**] *Angew. Bot.* 1958, **32,** No. 1/2, 8–26, bibl. 14, illus. [Landw. Versuchsstat. der BASF, Limburgerhof, Pfalz, W. Germany]

Abnormalities of the vegetative organs of cereals caused by a too early or too heavy application of growth substances for weed control, are described. They include narrow, erect leaves, inrolled reed-like leaves (in some of which the ear is enclosed), late shoots which are still green at harvest time, and branched stems. In both barley and oats a higher incidence of late shoots was caused by 2,4-D ester (1 l./ha.) than by the amine salts of 2,4-D or MCPA (each at 1·5 l./ha.). In barley, the highest incidence of late shoots occurred when 2,4-D ester was sprayed between 30 and 40 days after sowing ; in oats, it occurred when sprayed 54 days after sowing, and the incidence was higher.—D.B.

68† Straten, Ingeborg von der. Einfluss von Ultraschall und Ultraschall in Verbindung mit Wirkstoffen auf Keimung und weitere Entwicklung einiger Kulturpflanzen. [**The effect of ultrasonic waves and ultrasonic waves combined with active substances on the germination and further development of some cultivated plants.**] *Beitr. Biol. Pfl.* 1958, **34,** No. 2, 315–58, bibl. 108.

The rate of water uptake increased in seed treated with ultrasonic waves (through water). Treatment over a short period accelerated, but over a long period inhibited, germination of barley. Antibiotics intensified the action of ultrasonic waves. F. Germ. s.—D.B.

69 Humphries, E. C. **The effect of removal of the root-system of barley on the production of ears.** *Ann. Bot., Lond.* 1958, **22,** No. 87, 417–22, bibl. 2. [Rothamsted Exp. Sta., Harpenden, Herts]

Complete removal of roots of barley plants, grown in water culture, at a stage before the plants have attained their maximum shoot number, results in a significantly greater number of ears at harvest. If the roots are excised when shoot number is beginning to decline the number of ears is decreased. The exact cause of the phenomenon is not known but it is suggested that it may be due to a temporary diversion of carbohydrate to the shoots when the roots are excised. F. s.—M.H.

70 Rid, H. and Süss, A. Die Verteilung von P^{32} im Boden und dessen Aufnahme durch Sommergerste bei verschiedener Bodenbearbeitung. [**The distribution of ^{32}P in the soil and its uptake by spring barley under different soil-cultivation treatments.**] *Landw. Forsch.* 1958, **11,** No. 1, 40–4, bibl. 27, English and French summaries. [Bayer. Landesanst. PflBau u. Pfl-Schutz, München, W. Germany]

The cultivation treatments were : (a) normal ploughing to 18 cm. ; (b) deep ploughing to 24 cm. ; and (c) normal ploughing and subsoil cultivation between 18 and 34 cm. The depth of penetration of P_2O_5 and its uptake by spring barley increased in the order a<b<c. F. Fr. s.—D.B.

71 Carlson, C. W. and Grunes, D. L. **Effect of fertilisation on yields and nutrient content of barley.** *Proc. Soil Sci. Soc. Amer.*, 1958, **22,** No. 2, 140–45, bibl. 18. [Agric. Res. Ser. U.S.D.A.]

MAIZE

See also Abs. 153, 236, 352, 372, 373, 396, 398, 416, 421, 422, 435, 436, 437, 451, 457, 465, 473, 482, 492, 494, 516

72 Mehrle, D. W. Der Maisanbau in den USA. Betriebswirtschaftliche und technische Probleme. [**Maize cultivation in the USA. Farming and technical problems.**] *Landw. Angew. Wissensch.* 1958, No. [not given], pp. 134, bibl. 52, French and English summaries.

Following a 10-months visit to the northern part of the USA corn belt, the author gives an account of : the state of maize cultivation in the USA ; American hybrid-maize breeding ; the techniques used in cultivation, harvesting, storage and processing of maize ; and the place of maize in the farming system.—D.B.

73 Green V. E., Jr and others. **Field corn production in South Florida.** *Bull. 582 Univ. Fla Agric. Exp. Sta.* 1957, pp. 44, bibl. 7, illus.

Information is given on : special cultural methods for growing maize on peat, muck and sandy soils ; fertilizer requirements on organic and sandy soils ; seed selection and treatment ; varieties ; autumn sowing ; white maize varieties ; insect control ; diseases ; bird depredations and insect pests of stored grain. The requirements for growing a maize crop in South Florida are summarized.—A.M.H.

74 Wofford, I. M. and others. **Plant populations, date of planting and nitrogen levels for field corn.** *Proc. Soil and Crop Sci. Soc. Fla* 1956, **16,** 352–9, bibl. 15. [Florida Agric. Exp. Sta., Gainesville]

With a uniform application of 79 lb. N/ac., yields of maize in 1955 were not significantly increased by increasing the plant population above 7000/ac. Sowing between 15 March and 15 April gave the highest yields. In 1956, changes in plant population, especially at high rates of N treatment, had a greater effect on yield than changes in N level. At low N levels, increasing the plant population did not increase yield appreciably. The highest yields were obtained at 11,000 plants/ac. with 220 lb. N/ac. and at 13,000 plants/ac. with 160 lb. N/ac. Yield declined as sowing was delayed after 1 March. Number of ears per plant and the average weight per ear decreased with higher sowing rates. F. s.—A.M.H.

75 Ludwig, J. W. and Harper, J. L. **The influence of the environment on seed and seedling mortality. 7. Depth of sowing of maize.** *Plant and Soil* 1958, **10,** No. 1, 37–48, bibl. 16. [Oxford Univ. Dep. Agric.]

Seed of the large-grained maize variety White Horsetooth was sown (a) at depths of 2·5, 5, 7·5 and 10 cm. in pots and in the field, and (b) at 2·5, 5, 10 and 20 cm. in the field with and without supplementary watering. Ultimate percentage emergence and time for 50% emergence were determined and soil-temperature measurements made. Emergence was reduced when maize was sown at depths greater than 2·5 cm. and soil-moisture conditions were maintained near field capacity. Low temperatures following sowing reduced emergence, especially with deep sowing. In drought conditions a sowing depth of 5 cm. or more is desirable. Late sowings at the greater depths gave 70–80% stands. A simple relationship was found between depth of sowing, time for 50% emergence and ultimate percentage emergence when temperature was controlled and the moisture-level was maintained near field capacity. Where moisture was not limiting, there was an inverse relationship between ultimate percentage emergence and time for 50% emergence. In experiment (a), the interaction between sowing date × depth of sowing and time for 50% emergence was highly significant.—R.B.

76 Viado, G. B. and others. **Planting dates of corn in relation to insect infestation.** *Philipp. Agriculturist* 1958, **41,** No. 8, 440–9, bibl. 9.

In field trials during 1956 and '57, maize was sown in the rainy season on 6 dates ranging from late May or early June, to early- or mid-August. Grain yields in both years declined markedly as sowing was delayed after the first date. Maize sown on the last 3 dates produced very low yields. Observations are made on the incidence of infestation by 6 insect spp. in the crops ; the most destructive sp. were *Pyrausta nubilalis* and *Heliothis armigera.*—P.J.B.

77 Galvez, N. L. and Bruce, R. C. **Soil fertility–corn population test in northern and southern Luzon provinces.** *Philipp. Agriculturist* 1958, **42,** No. 2 and 3, 49–59, bibl. 5. [Cent. Exp. Sta., College, Laguna, Philippines]

Optimum yields of unirrigated Philippine No. 3 hybrid yellow flint maize were obtained at 3 locations from 45–90 kg. applied N/ha. and a population density of 40,000–60,000 plants per ha. There was no response to P or K fertilization. Yields varied considerably between locations ; yields were greater in the dry season than in the wet season. Season significantly affected the interaction of soil fertility and plant population.—R.B.

78 Ordoveza, J. L. and Dano, P. L., Jr. **Effect of underdrainage on the yield of corn [maize] and the rate of drop of the water table.** *Philipp. Agriculturist* 1958, **42,** Nos. 2 and 3, 86–92. [Cent. Exp. Sta., College, Laguna, Philippines]

79 Romano, E. Quanta acqua è necessaria ad un impianto di irrigazione a pioggia. [**How much water is required with a sprinkler irrigation plant.**] *Publ. 122 Ann. Sta. Chim.-agr., Roma Ser. 3,* 1956–7, pp. 4.

From trials over 4 years with maize on clay soil near Rome, it is concluded that the amounts of water (rainfall plus sprinkler irrigation) required per ha. during the irrigation period are : grain maize, 800 cu. m. (140 days irrigation period) ; fodder maize 200 cu. m. (80 days irrigation period).—E.B.O.

80 Puerta, F. de la. Barbecho semillado con maíz. [**Fallow sown with maize.**] *Agricultura, Madr.* 1958, **27,** No. 315, 365–9, illus.

This paper deals with the growing of maize in a non-irrigated farm in Seville province, Spain.—E.B.O.

81 Dow, A. I. **1957 tests with corn.** *Ext. Circ. 287 Washington Inst. Agric. Sci. Ext. Serv.* 1957, pp. 6.

Six maize varieties were grown at 3 locations in the Columbia Basin. Wisconsin 413 hybrid yielded well and had the most desirable moisture-content at harvesting. In fertilizer trials, Wisconsin 642 showed good responses to N at 80 lb./ac. on fertile land in 2 regions ; in 3 other areas 160, 240 and 320 lb. N/ac. were required for maximum yields. No definite response to P, K, or Zn was observed.—R.B.

82 KAVANAGH, L. R. **The sowing of hybrid maize. Which hybrid is best?** *Agric. Gaz. N.S.W.* 1958, **69**, No. 6, 316–23, illus.

The results are given of yield trials of 17 varieties in 13 districts.—A.M.H.

83 HACKBARTH, W. P. **Competition between corn and weeds.** *Iowa State Coll. J. Sci.* 1957, **32**, No. 2, 182–3. [Received May, 1958]

In field trials in Iowa, hand-weeded maize plots gave 50% higher yields than unweeded plots. Weed control early in the growing season was most important for high maize yields. Fresh weights of *Setaria* spp., *Setaria* spp. + *Amaranthus retroflexus* mixtures and *A. retroflexus* averaged 4691, 4276 and 3954 lb./ac., respectively. Maize grain yield was reduced by *Setaria* spp. from 112 to 10 bu./ac., by the *Setaria* spp. + *A. retroflexus* mixture from 97 to 16 bu./ac., and by *A. retroflexus* from 100 to 32 bu./ac. The stalk/ear ratio of maize on hand-weeded plots was 0·43, compared with 2·44 on plots infested with *Setaria* spp. In glasshouse trials, *Setaria* sp. was a more effective competitor against maize than *Abutilon theophrasti*.—P.J.B.

84 VEATCH, C. **Pre-emergence and emergence weed control in corn [maize].** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 179–81.

In trials in W. Virginia, complete control of annual weeds during the growing season was obtained by using simazin at 2 or 4 lb./ac., G27901 at 4 lb., or diuron at 2 lb./ac. as pre-emergence or emergence sprays.—P.J.B.

85 BELL, R. S. and others. **Pre-emergent weed control tests with silage corn.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 182–5.

In trials in 1956 in Rhode Island, applications of monuron as karmex W at 0·5 lb.; diuron as karmex DW at 1 lb. and neburon at 15 lb./ac. reduced stands of broad-leaved weeds, with no reduction in maize yields. In 1957, dinoseb, simazin, G-30028 2-chloro-4,6-bis-(isopropylamino)-*s*-triazine and emid (75% 2,4-dichlorophenoxyacetamide) reduced stands of broad-leaved weeds, but only emid significantly reduced stands of annual grass weeds. A combination of herbicidal treatments so as to eliminate up to 3 cultivations, followed by one cultivation in late June, was considered the most suitable practical procedure for Rhode Island conditions.—P.J.B.

86 EIJNATTAN, C. L. M. van. **A preliminary investigation on the resistance to West African stemborers in *Zea mays*.** *Memo. 13 W. Afr. Maize Res. Unit, Ibadan*, 1958, pp. 13, bibl. 17. [W.A.M.R.U., Dep. Agric., Moor Plantation, Ibadan, Nigeria]

Of the hybrids tested, only the backcross of Minnesota A42.645 × WAMRU 2 to the Minnesota parent was significantly more resistant to stemborer (mainly *Sesamia poephaga*, *S. botanephaga*, *S. calamistis* and *Busseola fusca*) attack than was the local variety.—A.M.H.

87 RILEY, G. B. and BARNES, D. Investigaciones sobre el ataque del trip (*Frankliniella* sp.) en maíz. [**Investigations on thrips (*Frankliniella* sp.) attacking maize.**] *Fol. téc. 24 Sec. Agric. Ganad., Méx.* 1958, pp. 32, bibl. 30, illus., English summary.

This report evaluates factors contributing to reduced yields of maize grown under irrigation in Mexico. Several insecticides tested gave excellent control of thrips, but their effects on yields were inconclusive. There appeared to be no varietal difference in resistance to thrips. Hybrid varieties yielded 25–30% more than local varieties. Agronomic practices, such as irrigation method, fertilizer application and sowing date, were more important in ensuring high yields than was the control of thrips. In heavy clay soils, the best results were obtained by sowing about 15 March with a heavy application of chemical fertilizer and by applying frequent, light irrigations. F. Eng. s.—E.B.O.

88 MANSFELD, K. Schäden durch Wirbeltiere am Mais (*Zea mays*), ihre Erkennbarkeit und ihre Verhütung. [**Damage to maize by vertebrates, its recognition and avoidance.**] *Dtsch. Landw.* 1958, **9**, No. 5, 217–21, bibl. 5, illus.

This is a literature review which gives an account of the damage done to the seeds, seedlings, growing plants, and the cobs of maize by various animals including birds. Measures for protecting the crop are indicated.—D.B.

89 MESA, B. D. Historia natùral del maíz. [**Natural history of maize.**] *Rev. Acad. colomb.* 1957, **10**, No. 39, 13–106, bibl. 85, illus.

The information collected in this paper (probably the first history of maize written in Spanish) shows the importance of maize in the Americas in past times, and explains the theories which have been advanced as to its possible centre of origin.—E.B.O.

90 FUKUI, H. N. and others. **Growth substances in corn pollen.** *Pl. Physiol.* 1958, **33**, No. 2, 144–6, bibl. 14. [Michigan State Univ., East Lansing]

The ether extract of maize pollen was separated into acid and neutral fractions. The former contained 3-indoleacetic acid and two other growth-promoting substances. The growth regulator in the neutral fraction did not possess an indole moiety.—M.H.F.

91 JUDIN, B. F. [**Some peculiarities of maize flowering in the Middle Urals.**]

[Russian] *Bot. Ž.* (*Bot. J., USSR*) 1958, **43**, No. 6, 861–7, bibl. 13, illus. [All-Union Inst. Plant Industry, Leningrad]

There is information on the phenological phases of different maize varieties, with special reference to protandry and protogyny in plants (from various latitudes) grown in the Sverdlovsk and Poltava regions.—M.H.

92 Fernández, G. R. and Laird, R. J. Efectos de la sequía durante el espigamiento en maíz fertilizado con diferentes cantidades de nitrógeno. [**Effects of drought during earing in maize manured with various quantities of nitrogen.**] *Fol. tec. 30 Sec. Agric. Ganad., Méx.* 1958, pp. 28, bibl. 24, illus., English summary.

See *Fld Crop Abstr.* 11 : 537.

93 Seatz, L. F. and others. **Anion effects on plant growth and anion composition.** *Proc. Soil Sci. Soc. Amer.*, 1958, **22**, No. 2, 149–52, bibl. 11. [Tennessee Agric. Exp. Sta., Knoxville]

In pot studies, using soils with equivalent anion concentrations, chloride dressings produced significantly less maize growth in one month than sulphates or carbonates, but the chlorine contents of the plants were greatly augmented without alteration of the sulphur or phosphorus levels.—M.H.F.

94 Shalhevet, J. and Zwerman, P. J. **Nitrogen response of corn under variable conditions of drainage — a preliminary greenhouse study.** *Soil Sci.* 1958, **85**, No. 5, 255–60, bibl. 12, illus. [Cornell Univ.]

Plants of the maize variety Ohio 51 AxB8 were grown in a mixture of equal parts of fine, sandy-loam topsoil and builders' sand in 44-gal. oil drums, 12 plants to a drum. Superphosphate at 300 lb./ac. was mixed with the soil and sand. All the drums received 100 ppm. K and 145 ppm. Ca in solution ; a solution added to some of the drums contained 100 ppm. nitrate N, the remainder receiving no added N. Three water-levels were used in the drums : (a) 4 in. from soil surface, (b) fluctuating, (c) low. The dry-weight of the maize tops and roots and the height of plants in the (a) + N and (b) + N treatments were greater than those in the (a) and (b) treatments without N, and about the same as in the (c) + N treatment. Top growth was correlated with weight of roots but not with the soil volume occupied by roots or their depth, despite the fact that roots could not penetrate the water-table irrespective of N supply. F. s. —R.B.

95 Bressani, R. and Mertz, E. T. **Studies on corn proteins. 4. Protein and amino acid content of different corn varieties.** *Cereal Chem.* 1958, **35**, No. 3, 227–35, bibl. 17. [Purdue Univ. Agric. Exp. Sta., Lafayette]

Grain analyses are reported of commercial maize varieties, a shrunken floury maize mutant, teosinte [*Euchlaena mexicana*] and a teosinte × maize cross. American and Guatemalan maizes were similar in amino-acid composition. Pericarp plus tip cap contained 1·8–3·3%, endosperm 68·4–83·2% and germ 14·6–29·2% of grain nitrogen. The nitrogen components of endosperm and germ were separated into insoluble, acid-soluble, alkali-soluble and alcohol-soluble fractions. The lysine contents of the fractions were determined. Maize lysine-content could be increased by breeding for larger germ size or by increasing the relative percentages of the acid- and alkali-soluble endosperm fractions.—M.H.F.

96† Pennacchiotti, M. Irma and others. Valoración microbiológica de riboflavina en maíz. [**Microbiological determination of riboflavin in maize.**] *Agricultura téc., Santiago* 1956, **16**, No. 2, 88–91, bibl. 9, English summary. [Inst. Invest. Vet., Minist. Agric., Chile] [Received July, 1958]

The riboflavin content was determined in 30 samples of the maize variety Camelia and in 30 of the variety Minnesota, using *Lactobacillus casei* 9595. The value obtained for both varieties was 0·40 mg. of riboflavin per 100 g. of fresh matter.—E.B.O.

97 Lanza, F. La nutrizione minerale del mais. 2. Effetti della concimazione fosfopotassica e azotata, della classe di maturità dell'ibrido e della precessione colturale sulla resa unitaria di granella. [**The mineral nutrition of maize. 2. Effects on grain yield of PK and N manuring, of the maturity class of the hybrid, and of the preceding crop.**] *Maydica* 1958, **3**, No. 3, 80–94, English and German summaries.

An account is given of the second-year trials (1957) in which the chemical manuring of maize was investigated in Milan and Bergamo provinces using 3 hybrids of different vegetative cycles. Under the conditions of these trials, yields were affected significantly by increasing amounts of PK fertilizer applied, and by the preceding crop. There were no differences in yields due to increasing amounts, type and time of application of the N fertilizer, or to the maturity class of the hybrid. [See also *Fld Crop Abstr.* 11 : 1461.]—E.B.O.

98 Sánchez, D. N. and others. Fertilizantes y densidad de población para el maíz en Veracruz. [**Fertilizers and plant density for maize in Veracruz (Mexico).**] *Fol. Divulg. 27 Sec. Agric. Ganad., Méx.* 1958, pp. 16, illus.

Low soil fertility is a cause of low yields of maize in Veracruz. In field trials in 13 localities, the average yield of unmanured maize was 2·31 metric tons per ha. Increases in yield were obtained with the application of N in 12 localities (0·23 to 2·10 tons increase from 60 kg. N, per ha.,)

of P in 5 localities (0·97–2·26 tons from 40 kg. P_2O_5, per ha.) and of K in one locality (0·76 ton from 40 kg. K_2O/ha.). With the maize hybrids H-501 and H-503, the recommended plant density is 35,000 plants/ha.—E.B.O.

99 COAKER, T. H. and DAVIES, J. C. **Palatability of maize under storage in Uganda.** *E. Afr. agric. J.* 1958, **24**, No. 1, 57–60, bibl. 2. [Emp. Cott. Gr. Corp., Namulonge, and Kawanda Res. Sta., Uganda]

Little or no distinction in palatability could be made between maize with various levels of insect infestation, up to 50% damaged grains, but grain deterioration after long storage was a major factor contributing to poor palatability. The distinction between old and new maize was more apparent in hammer-milled flour than in roller-milled, which contained less of the germ.—A.M.H.

100 DEPARTMENT OF AGRICULTURE, BASUTOLAND. **Annual report 1957.** Maseru, [n.d.], pp. 71, illus. [Received Sept., 1958]

1. NPK trials, pp. 39–44. Maize, wheat and sorghum showed large positive responses to P at all centres but one. Responses to N were inconsistent, but large in some cases. There were no responses to K.

2. Rate and time of N application, and plant espacement, pp. 44–6. On average, 3 × 1 ft. was the optimum spacing for maize, followed by 3 × 1·5 ft. in one trial and 3 × 0·5 ft. in another. Response to N was related to spacing. Time of application (at 6 weeks, or half at 6 weeks and half at tasseling) had little effect.

3. N and monoculture of maize, pp. 47–8. 20 or 40 lb. N/ac. ploughed-in in winter significantly increased yields. A summer side-dressing of 20 lb. N/ac. increased yields, both where no winter N was applied and no stover ploughed-in, and where N was ploughed-in in winter with 2 tons dry stover/ac.

4. Minor elements for maize, pp. 54–5. On a foothill red loam, there were significant responses to Mn (15 lb. $MnSO_4$/ac.).

5. First-year residual effects of manure, manure ash and superphosphate on maize, p. 55. Manure ash at 50 and 75 lb. P_2O_5/ac. and kraal manure at 75 lb. P_2O_5/ac. gave significant yield increases.

6. Tillage experiment, Maseru, pp. 56–8. Subsoiling or deep (20-in.) ploughing, especially where combined with an application of 300 lb. gypsum/ac. increased maize yields by 0·6–3·0 bags/ac. (1 bag = 200 lb.).—A.M.H.

SWEET-CORN

See also Abs. 395

101 KITCHIN, J. T. **Quack grass control with amino triazole and its effect upon a succeeding crop of sweet corn.** *Proc. 12th N.E. Weed Contr. Conf.* 1958, 88–9, bibl. 2. [New Hampshire Agric. Exp. Sta., Durham]

In trials during 1956 and '57 in New Hampshire on sandy loam, ATA at rates of 0, 4 or 8 lb/ac. (50% a.i.) in 50 gal. spray was applied as follows : (a) in autumn (10 Oct.), followed by ploughing 20 days later ; (b) in spring (8 May), followed by ploughing in autumn ; (c) in spring (8 May), followed by ploughing 16 days later; (d) in autumn, followed by ploughing in spring (24 May). Sweet-corn was sown on all plots on 29 May. Both autumn treatments resulted in better control of *Agropyron repens* than the spring treatments ; treatment (d) gave the best control. Treatment (d) resulted in significantly higher ear numbers and ear weights of sweet-corn than any other treatment ; the differences in yield between the 4 and 8 lb./ac. rates of application were not significant.—P.J.B.

102† LANING, E. R., Jr. **Sodium 2,2-dichloropropionate and sodium 2,2,3-trichloropropionate absorption and translocation in certain vegetable crops and residual activity in soil.** *Diss. Abstr.* 1958, **18**, No. 4, 1197. [Oregon State Coll., Corvallis]

As much ^{14}C-labelled dalapon and TPA was absorbed by sweet-corn [*Zea mays*] leaves within 2 hr. as within 7 days. ^{14}C was translocated primarily towards rapidly developing tissue, more rapidly in the case of dalapon than TPA. Increasing the rate of application resulted in a decrease in the percentage of translocated ^{14}C. Absorption and translocation of ^{14}C from both compounds were similar in plants sensitive [*Zea mays*] and resistant [*Lotus corniculatus*] to these herbicides. Growth responses of maize indicated that TPA was inherently more toxic than dalapon.—R.B.

MILLETS AND SORGHUMS

See also Abs. 100, 351, 352, 379, 380, 457, 483, 494

103† NANDA, K. K. and CHINOY, J. J. **Lateral bud development in 'pearl millet' (*Pennisetum typhoides* Stapf *et* Hubbard) in relation to its flowering.** *Curr. Sci.* 1958, **27**, No. 4, 141–3, bibl. 8, illus. [Univ. Delhi, India]

Observations were made on the development of primary, secondary and tertiary branches from the main (and succeeding) stalks of *P. typhoideum*, and their flowering. A diagram shows the pattern of branching. The spikes on lateral branches were sterile. It is thought that this branching phenomenon expressed a disorganization in some of the developmental phases and resulted from unfavourable photoperiod.—D.B.

104 PIERSON, C. Quelques considérations sur la culture du sorgho au Ruanda-Urundi. **[Some considerations on sorghum-growing in the Ruanda-Urundi.]** *Bull. agric. Congo belge* 1958, **49**, No. 2, 397–419, illus., Flemish summary. [Sta. Rech. Agron. INÉAC, Rubona]

In a great part of the Ruanda-Urundi, sorghum, the staple food crop, is the basis of many rotations. The information given on sorghum includes a description of local varieties, uses (flour and beer-making) and seed treatment for controlling covered smut (*Sphacelotheca sorghi*).—E.B.O.

105 Simmons, K. V. **Grain sorghum investigations at Yanco Experiment Farm.** *Agric. Gaz. N.S.W.* 1958, **69**, No. 5, 225–32, bibl. 2, illus.

The characteristics and yields in 1947–57 of the following varieties are given : Caprock, Wheatland, Redbine 66, Martin, Alpha and Waxy Combine Kafir. In seed-rate trials with 28-in. row spacing and furrow irrigation, 8 lb. seed/ac. gave the highest yields. Where moisture conditions were apt to deteriorate quickly, the 16 lb./ac. sowing was most affected. Where the crop was "irrigated up" (as opposed to sowing into a moist seedbed), 28-in. rows under furrow irrigation gave higher yields than closer row spacings under flood irrigation. Where the crop was sown into a moist seedbed, all treatments gave similar yields, except that the 7-in. row spacing, flood irrigated, yielded less in 1 year. Irrigation before, rather than at, wilting increased yield.—A.M.H.

106 Indian Farming. **More jowar.** *Indian Fmg* 1958, **8**, No. 4, 3. [Jalgaon Government Farm, Bombay State]

A 35% increase in grain yield of *Sorghum vulgare*, 54% increase in fodder yield and an additional income of Rs. 20 per ac. were obtained during 3-yr. trials in the monsoon season at the above Institute by adopting 2 cultivation measures not already practised by farmers : (1) a row-spacing of 24- instead of 18-in. ; (2) application of fertilizers (none given at present) at the per ac. rate of 5 cartloads of f.y.m., 111 lb. superphosphate drilled at sowing time, and 200 lb. $(NH_4)_2SO_4$, half at sowing and half 3 weeks later.—D.B.

107 Stokes, I. E. and others. **Culture of sorgo for sirup production.** *Fmrs' Bull. 2100 U.S. Dep. Agric.* 1957, pp. 32, illus.

The cultivation and processing of sugar sorghum is described, and the varieties Sart, Hodo, Tracy, White African, Honey, Sugar Drip, Atlas and Wiley are compared.—R.B.

108 Passlow, T. **Destruction of sorghum midge in seed grain.** *Qd J. agric. Sci.* 1958, **15**, No. 1, 37–8, bibl. 2.

Cleaning, grading and treating sorghum seed with BHC dust (0·5–1% γ isomer) at 3 oz./bu. gave control of *Contarinia sorghicola* adequate for most purposes. For quarantine, fumigation with CS_2 (10 lb./1000 cu.ft. for 24 hr.) was also necessary.—A.M.H.

RICE

See also Abs. 153, 377, 421, 425, 494

109 Bhatnagar, P. S. **Practical hints for paddy growers in Uttar Pradesh.** *Tech. Bull. 3, Bur. agric. Inf., U.P.* 1957, pp. 14.

The following information is included in these hints. Ten seed beds, each 12 ft. × 16 ft., provide enough seedlings for transplanting 1 ac. The techniques for transplanting seedlings and for broadcasting or dibbling seed (where transplanting is impossible) are described. Two irrigations are recommended : (1st) 2 in. deep, given 2 weeks after transplanting ; (2nd) 3 in. deep, given at dough stage. Methods for preventing lodging are : growing varieties resistant to lodging ; avoiding late irrigation ; tying 6–8 plants together near the base of the spike ; topping leaves [to] 6–8 in. 6 weeks before heading ; placing plants 1 – 1·5 ft. apart (4 seedlings per hill) ; ridging the crops 6–8 weeks after planting. The best rotation for the whole of Uttar Pradesh is, wherever facilities for irrigation exist, rice/berseem clover (*Trifolium alexandrinum*) ; and for eastern districts of Uttar Pradesh, rice/gram (*Cicer arietinum*) or rice/chatri-matri (*Lathyrus sativus*). The rice crop is harvested when the grains have "set hard" even though the leaves are still green. The seed is exposed to the sun for 2–3 days before storing. A list of improved varieties is given together with their distinguishing characteristics and the States for which they are suitable.—D.B.

110 Rao, P. N. Ananthakrishna. **Some aspects of paddy improvement in the district of South Kanara.** *Mysore agric. J.* 1957, **32**, Nos. 3 and 4, 186–96, bibl. 1.

Rice occupies 80% of the cultivated area of South Kanara and is almost the only cereal grown there. The aspects of rice cultivation discussed, as they apply to this area, are : water resources ; drainage ; manuring ; the use of improved strains for first- and second-crop rice ; the semi-dry method of raising nursery seedlings ; the Japanese method of rice cultivation ; and the maintenance of seed purity.—D.B.

111 Instituto Rio Grandense do Arroz. 13°. Anuário estatistíco do arroz. Safra 1956–57. **[13th statistical yearbook on rice. 1956-7 harvest year.]** 1958, pp. 143, map.

Tabulated information is given on rice-growing in Rio Grande do Sul, Brazil, in particular on : crop areas, yields, production, varieties, sowing date, rainfall, irrigation, machinery, prices and exports.—E.B.O.

112 Hernaez, A. **Palagad rice culture using "dapog" seedlings.** *Philipp. J. Agric.* 1955, **20**, No. 3–4, 131–9, bibl. 4, illus. [Bur. Pl. Industr., Philipp. Dep. Agric., Manila] [Received September, 1958]

Palagad is a term used in many regions of the Philippines to denote the culture of lowland rice during the dry season following the harvesting of the normal rice crop. Fields with a sufficient supply of irrigation water from December to May are suitable ; palagad rice is planted in some areas in April or May and harvested during July–September. Owing to heavy weed infestations, broadcast pregerminated seedlings yield 12–20 cavans/ha. [1 cavan = 44 kg.] less than transplanted seedlings. Seedlings grown in ordinary seed-beds require 22–30 days to grow and develop before it is possible to transplant them, therefore the dapog method of raising seedlings is frequently used. For this a trench 30 × 1 m. is dug to a depth of 5 cm. and the soil used to build a dyke round it. This area (sufficient for 1 ha. of transplanted rice) is covered with fresh banana leaves, followed by 2–3 cm. of rice chaff or chopped rice straw and finally a thin layer of very fine soft mud. Germinating seed is sown evenly on this seed-bed, and watered by sprinkling for 2–3 days. Slowly running irrigation water is then applied. Seedlings are ready for transplanting in from 8–12 days after sowing. Mats of seedlings are cut from the bed into small squares, and transported to the field, where the plants are carefully removed from the mats immediately before transplanting. The roots of dapog seedlings grow laterally instead of downwards. The dapog method gives yields of 3–8 cavans/ha. greater than those of conventionally planted seedlings. Recommended rice varieties for palagad culture are listed.—R.B.

113 YABUKI, K. **Studies on temperatures of water layer in paddy fields.** [Japanese] *Bull. Univ. Osaka Pref. Ser. B*, 1957, **7**, 113–46, bibl. 51, English summary.

A study was made of the temperature of water in a paddy field. Graphs show the horizontal distribution of temperatures and the diurnal variations in the temperature of water in irrigated fields. The temperature of irrigation water in the early morning had the least influence and its afternoon temperature the greatest influence (lasting until the following morning) on the temperature of water in a paddy field. F. Eng. s.—D.B.

114 SATO, I. and others. **Studies on field drying of reaped rice plants in San-in District. 3. The survey on the drying of reaped rice plants in the region where high- and many-bundle-hangers are to be seen.** [Japanese] *Trans. Tottori Soc. agric. Sci.* 1957, **11**, No. 3, 187–94, bibl. 3, illus., English summary. [Tottori Univ.]

Tall, multiple hangers for rice drying are used in districts where conditions for drying are poor. Because of the labour and time required to construct and load them, they are being replaced by low, single-bundle-hangers. At the same time, drying conditions are being improved by better field-drainage. Threshing is mechanized. F. Eng. s.—D.B.

115 GAROT, A. Padi sebagai tanaman sela (catch crop) pada tanaman ulangan karet di kebun tjikumpaj. [**Planting rice between young rubber.**] *Menara Perkebunan* 1958, **27**, No. 5, 123–7, illus. [Pusat Perkebunan Negara, W. Java]

The advantages of interplanting young rubber trees with rice are discussed. The value of the rice crop exceeded the total expenditure on cultivation. F. Eng. s.—A.M.H.

116 GREEN, V. E., Jr. **A survey of rice culture on organic soils.** *Proc. Soil and Crop Sci. Soc. Fla* 1956, **16**, 336–51, bibl. 68, illus. [Everglades Exp. Sta., Belle Glade, Florida]

Literature on the cultivation of rice on organic soils is reviewed. The results of chemical studies in the Everglades region of Florida are considered in more detail.—A.M.H.

117 VOLLEMA, J. S. **Mechanized rice-growing in Netherlands New Guinea.** *Quart. Bull. S. Pacif. Comm.* 1958, **8**, No. 3, 30–1, illus.

This progress report on a rice-growing project which was begun in 1956 with the object of making Netherlands New Guinea self-supporting in rice, shows that, despite pest attacks, yields from early experimental sowings were encouraging..—E.B.O.

118 GRILLOT, G. Expérimentation rizicole. [**Rice trials.**] *Bull. 68 Soc. Agric. Maroc* 1956, 18–28. [Received March, 1958]

An account is given of rice trials in Morocco, mainly in the Rharb, to study varieties and manuring. Observations were made on 70 varieties from Japan ; these are all of medium height, have short grains, are almost all late, and are resistant to lodging. Several of them, in particular some strains of Norin, Shinzu and Chiusei Asahi, yielded better than Colusa 1600 and Rinaldo Bersani. Results from manuring trials since 1953 confirmed that, in general : (a) organic manuring and N manuring were effective ; (b) P applied before sowing at the rate of 300–600 kg. of superphosphate per ha. had little, or no, effect.—E.B.O.

119 PIACCO, R. Introduzione di varietà di riso argentine. [**Introduction of rice varieties from Argentina.**] *Sementi elette* 1958, **4**, No. 3, 16–24, illus., English and German summaries.

Eight rice varieties were introduced into the Po Valley, Italy, from Argentina, in 1955. One only, Japonesito de tres mes, was satisfactory. This lodging-resistant variety has a vegetative cycle of 130 days, matures in mid-September, and has a short, vitreous grain.—E.B.O.

120 Cada, E. and others. **Performance of introduced rice varieties from Indonesia.** *Philipp. J. Agric.* 1955, **20**, No. 3–4, 175–207, bibl. 8, illus. [Maligaya Rice Exp. Sta., Nueva Ecija, Philippines]

From 18 Indonesian rice varieties, 8 were selected for performance tests and their agronomic characters compared with those of Apostol. The following heading periods were recorded : Apostol, 3 days ; Malaman 350, 11 days ; Brondol Putih T-43, Bengawan and Intan, 13 days ; Peta and Salak, 14 days ; Tjina and Tjahaja, 18 days. Five days after the beginning of heading, 39% of the principal panicles of Apostol had emerged. The Indonesian varieties were slower in reaching the peak of heading, which was less well defined than in Apostol. The time taken for each variety to reach maturity varied according to the date of sowing and the age of seedlings when transplanted. Apostol appeared to be more sensitive to day-length than the other varieties. Brondol Putih T-43, Intan, Malaman 350 and Peta tillered to about the same extent as Apostol, while Tjina and Salak were poorer in tillering capacity. Apostol, Peta, Intan and Tjahaja were relatively shorter in height than Brondol Putih T-43 and Tjina. Under Philippine conditions Tjahaja and Bengawan were resistant to lodging ; the other varieties were susceptible in varying degrees. Tjina, Intan and Bengawan were relatively resistant to *Piricularia oryzae*. The 9 varieties did not differ significantly in yield when grown on unirrigated sandy loam. On irrigated clay loam, Peta gave significantly greater yields than all varieties except Brondol Putih T-43 and Intan ; these 3 varieties gave higher yields than Apostol. Salak gave the greatest total percentage milling recovery (69·3). Intan gave the greatest percentage of head rice (81·6), Malaman 350 the lowest (54·2). Other varieties giving high yields of head rice were Tjahaja (78·5%) and Apostol (77·7%). In eating quality, Intan and Tjahaja were very good ; Bengawan and Tjina, good ; Malaman 350 and Salak, fair; Brondol Putih T-43, poor. Peta, Brondol Putih T-43, Intan and Tjahaja were recommended for general sowing in Central Luzon. F. s.—R.B.

121 Bhatnagar, P. S. and Bajpaye, N. K. **A new variety of paddy Type-139.** *Tech. Bull. 5, Bur. agric. Inf., U.P.* 1958, pp. 3.

This is a late variety which matures in 140–145 days. It is 5–6 ft. high, stiff strawed and resistant to lodging. Its deep-purple leaf sheath is a useful character for identifying this variety and facilitating roguing at an early stage of growth. It is expected that T.139 will replace T.36 in S.E. Uttar Pradesh where T.36 is not popular because of its insipid taste (though it will still be used for preparing rice products).—D.B.

122 Mau-Kong, W. and Sun-Chan, Y. **New improved rice variety "Chialungyu No. 242" for recommendation.** [Chinese] *Agric. Res. Taiwan* 1957, **7**, No. 1, 25–34, illus., English summary. [Chiayi Branch Sta., Taiwan Agric. Res. Inst.]

The new variety is widely adaptable, and gives a high yield of superior-quality rice. From transplanting to heading, 82 days are required for the first crop and 62 days for the second crop. Chialungyu No. 242 is approximately 5 days later than Taichung No. 65 and 2–3 days earlier than Chianan No. 3. Yields obtained from the 1st and 2nd crop of Chialungyu No. 242 in the central, southern, eastern and Chianan districts, show its superiority when compared with local varieties. The highest yield (7065 kg./ha.) was obtained from the first crop in the central district and the lowest yield (3284 kg./ha.) from the second crop in the southern district. F. Eng. s.—D.B.

123 Umali, D. L. **Status of rice improvement in the Philippines.** *Philipp. Agriculturist* 1958, **41**, No. 8, 423–31.

A brief review is given of the current programme for rice improvement and the production of certified seed.—P.J.B.

124 Ciferri, R. Il problema della vegetazione delle alghe in risaia. [**The problem of algae in rice-fields.**] *Riso* 1958, **7**, No. 7, 10–13, illus.

Information is given on the species of algae present in rice-fields in Italy and on their succession during the rice-growing period.—E.B.O.

125 Velasco, J. R. and others. **Effects of repeated herbicide spraying on upland rice.** *Philipp. Agriculturist* 1958, **41**, No. 8, 432–9.

In field trials, upland rice (var. Azucena) was treated with 2,4,5-TP at 0·75 lb./ac. at 10, 15, 20 or 30 days after sowing, or on 2, 3 or 5 successive occasions, up to 75 days after sowing. Plant heights were measured at 45, 60 and 75 days after sowing. Treatment once with 2,4,5-TP resulted in some plant height reduction, though this effect disappeared within one month. At the last date of measurement, all treated plants were taller than untreated controls, and this was attributed to the effect of the weeds on control plots, despite the fact that all control plots were hand-weeded twice. Only where plots received one application of 2,4,5-TP (except at 20 days after sowing) were plant heights significantly greater than those of controls. No treatment significantly affected grain yields. Treatments at 15 days after sowing, followed by a second at 30, 45 or 60 days after sowing, resulted in mean yields ranging from 132 to 134 g. per 1·6 sq.m., compared with 118 g. for controls. Spraying twice was as effective against weeds as spraying 3 or 5 times ; best control was secured

where two treatments were spaced 30–45 days apart.—P.J.B.

126 JOHNSTON, A. **Diseases of padi.** *Malay. Agric. J.* 1958, **41,** No. 1, 10–17, illus.

Control measures are suggested for brown spot (*Helminthosporium oryzae*) and blast (*Piricularia oryzae*) which affect rice crops in Malaya.—E.B.O.

127 PUTTARUDRIAH, M. and USMAN, S. **Flood causes army-worm outbreak.** *Mysore agric. J.* 1957, **32,** Nos. 3 and 4, 124–31, bibl. 8, illus.

Dry weather followed by heavy rains in September and October favoured the development of *Leucania unipuncta* which attacks forage plants, millets and cereals, especially rice. The pest was completely controlled, in the initial stage of the outbreak : (a) on *Eleusine coracana,* by 10% hexamar at 10–12 lb. per ac. ; and (b) on rice, by 5 cc. folidol E 605 in 4 gal. water, or by 50% wettable DDT at the rate of 1 lb. in 16 gal. water [per ac.].—D.B.

128 NARAYANAN, T. R. and others. **Studies on pre-treatment of seeds with chemicals. 1. The effect of pre-soaking the seed in various chemicals on the growth and yields of paddy.** *Madras agric. J.* 1958, **45,** No. 7, 255–67, bibl. 16. [Agric. Res. Inst., Coimbatore]

An account is given of the effect on germination, tillering, plant height, grain- and straw-yield of pre-soaking rice seeds in solutions of nutrient salts. K_3PO_4 at 10 or 20% concentration induced the most consistent increases in grain yield. The financial gain from increased yields was 4–6 times the cost of treatment. F. s.—D.B.

129 FUKAKI, S. and KONDO, M. [**An investigation on the tillering of rice plants (*Oryza sativa*). 7. Upon the translocation of plant-substances during earing as determined by the specific gravity of the dry matter of rice, wheat and barley plants.**] [Japanese] *Tech. Bull. Kagawa Agric. Coll.* 1956, **8,** No. 1, 8–14, bibl. 4, English summary.

The " specific powder gravity " [sp. gr. of the dry matter] of the ear, internode, ear stalk, leaf blade, and leaf sheath of rice, wheat and barley plants, determined every 3 days from the beginning of earing to maturity, demonstrated the movement of nutrients from the vegetative organs of the plant to the inflorescence and grains of rice, wheat and barley. F. Eng. s.—D.B.

130 MISRA, G. and SAHU, G. **Interaction of hormone and photoperiod in an early variety of rice.** *Nature, Lond.* 1958, **181,** No. 4609, 637, bibl. 9. [Bot. Dep., Ravenshaw Coll., Cuttack, India]

[See also *Fld Crop Abstr.* 11 : 566.] The early variety *N* 136 of *Oryza sativa* is intermediate in its photoperiodic reaction. The data show that : ear emergence was delayed in plants subjected to NAA treatment only, and also in plants where this was followed by short photoperiod (8 hr.) ; in plants subjected to short photoperiod alone, there was increased tillering in late stages, but when the only treatment was soaking the seed in the hormone, there was less vegetative growth in general. Grain yield was significantly higher in plants treated simply with IAA (2·8 g. per plant) and also in those treated with NAA plus the short photoperiod (3·64 g. per plant) compared with the control (2·2 g. per plant).—M.H.

131 VELASCO, J. R. and FUENTE, R. K. DELA. **The response of forty-six rice varieties to photoperiod.** *Philipp. Agriculturist* 1958, **42,** No. 1, 12–17, bibl. 5. [Cent. Exp. Sta., Laguna, Philippines]

Six seedlings of each of 46 rice varieties were grown under : (a) 10-hr. days, (b) 12-hr. days, (c) 15-hr. days. After 2 months, plants which had not flowered were dissected to determine whether floral primordia were present. Of the varieties investigated, 3 were delayed in flowering by (a). They were Solo, which was slightly less delayed by (c) than (a), and Taihoku no. 111 and Shinchiku mochi iku no. 43, both of which were longer delayed in flowering by (c) than by (a). These varieties appeared to have a narrowly defined optimum daylight requirement of approximately 12 hr. The varieties Fortuna negro, Zenith × Nira (S415 A16-5-1-3), P.I.7217, Rikuto sanin no. 25 and Taishomochi flowered within a span of 10 days under all treatments and were considered day-neutral. Varieties considered weakly photoperiodic, i.e. those in which the difference in time of flowering between treatments (a) and (c) was less than 30 days, were : P.I. 160650, Norin mochi no. 5 L44, Tainan-iku no. 490, Sinto norim no. 29, Arborio tipo, Imperial blue rose selection, Hill med. × Zenith Bnt. 54, Shinchiku mochi iku no. 43, P.R. 388, P.I. 8920a, Sinoltero, R.B., Blue rose, (E.P.B.R.)^2 × 7·9054 rogue and Prelude. Strongly photoperiodic varieties, viz. those showing differences of more than 30 days in date of flowering under treatments (a) and (c), were : In-oban, P.T. selection (B52–3557), Taihoku iku no. 111, P.I. 160902, Thailand, B.A.M., Mitao, Fi Ho Ju, Rizzoto tipo, Zenith, Bolibol, Shinchiku-iku no. 161, Pin chuan B, P.R. 358, Macan 1, Co. 4 × ADT 10, Malagkit senador, C.I. 7266 Rec. B, Chiang An Chih Kei Cheih Lan, Remedja, BR × BR-R (6–1–21–12), Rexoro selection (B49–5849), Kinastila, Intan, and Bengawan. The percentages of very early, early, medium-late and late varieties which showed strong photoperiodic responses were 42·8, 64·3, 88·9 and 87·5, respectively. Of the 15 tropical varieties tested, 80% were strongly photoperiodic. Among varieties from sub-

temperate regions, strongly and weakly photoperiodic varieties were approximately equally represented.—R.B.

132 Tanaka, A. and others. **Studies on the nutrition of rice plant (*Oryza sativa* L.). 2. A comparative study of nitrogen requirement of *indica* and *japonica* varieties of rice.** *Proc. Indian Acad. Sci. (B)* 1958, **48**, No. 1, 14–27, bibl. 4, illus. [Central Rice Res. Inst., Cuttack]

O. sativa var. *indica* is cultivated in the tropics and var. *japonica* in the sub-tropics in latitudes above 30°N. or S. The latter strains respond to heavy manuring and give higher yields. The reason for this was investigated in pot experiments, with N at 0, 5, 20, 60 and 150 ppm. Photoperiod treatment was given to synchronize the developmental stages of the 2 varieties. At all stages of development and at all N levels, tops and roots of *japonica* were shorter than those of *indica*, but *japonica* produced more tillers per plant. At N levels up to 20 ppm. the *indica* variety gave higher grain yields than the *japonica* variety and reached its maximum grain yield at this level. *Japonica* attained its maximum grain yield (higher than the maximum for *indica*) at 60 ppm. N. The depression of the grain yield of *indica* at higher N levels is accounted for by the higher ratio of soluble- to protein-N in the reproductive stages which results in a decrease in the number of filled grains, and a lower sp. gr. of grains.—D.B.

133 Karim, A. and Khan Majlis, M. A. **A study of the formative effect of sulphur on the rice plant.** *Pakistan J. sci. Res.* 1958, **10**, No. 2, 52–5 and 51, bibl. 8, illus. [Dacca Univ.]

Rice, grown from seed in a soil containing 33 ppm. S, was supplied with additional S as Na_2SO_4 in quantities ranging from 6 to 50 lb. S/ac. Plant height, earliness in attaining maximum height, leaf area, number of tillers, and improvement of condition (as shown by the depth of green) increased with the amount of S supplied. The rice yield increased with applications of S up to 25 lb. S/ac. above which the rice yield remained practically constant. For this soil, the optimum addition of S was 25 lb./ac. because greater quantities produced unnecessarily bushy vegetative growth with many sterile tillers and grainless husks, and no further increase in rice yield.—D.B.

134 Go Ban Hong. [**On the mineral nutrition of lowland rice (*Oryza sativa* L.).**] [Indonesian and Dutch] 1957, pp. 193, bibl. 107, English summary. [Bogor, Univ. Indonesia]

An account is given of pot trials to study the water uptake, water requirement, growth, yield, and uptake of nutrients (N, P, K, Ca, Mg, Fe, Si) of rice, using the variety Tjina. F. Eng. s.—E.B.O.

135 Cunha, J. M. A. and Baptista, J. O método da análise foliar de Lundegårdh aplicado à cultura do arroz. [**Lundegårdh's method of leaf analysis applied to rice.**] *Agron. lusit.* 1957, **19**, No. 3, 251–62, bibl. 4, English and German summaries. [Esta. Agron. Nac., Sacavém, Portugal]

Rice plants, harvested in field-trial plots, were analysed for N, P and K. It was found that leaf analysis was not a reliable method for determining the mineral status of the soil, since, except for N, the index values obtained were not correlated statistically with the corresponding amounts of the mineral elements applied. As to P, the same index values were found for plants that had received very different amounts of phosphate. F. Eng. s.—E.B.O.

136 Glander, H. **Science and practice in the manuring of rice.** *Green Bull.* 1957, No. 6, pp. 28, bibl. 40.

The contents include information on rice-growing soils, removal of nutrients from the soil, and the beneficial effects of potash fertilizers on the physiology, yield and disease resistance of rice.—D.B.

137 Rao, K. Balakrishna and others. **Relative merits of Chilean nitrate and ammonium sulphate as manure for rice in South Kanara.** *Madras agric. J.* 1958, **45**, No. 5, 169–75, bibl. 7. [Paddy Breed. Sta., Mangalore]

Results from a 6-yr. experiment showed that $NaNO_3$ compared favourably with $(NH_4)_2SO_4$ as a fertilizer for rice. The former was the better for the first crop, the latter for the second crop. F. s.—D.B.

138 Digar, S. **Effect of ammonium sulphate and farmyard manure on the yield of paddy and on soil.** *J. agric. Sci.* 1958, **50**, No. 2, 219–26, bibl. 7. [State Agric. Res. Inst., Tollygunge, W. Bengal, India]

The effects on rice yield and on the soil of 5 levels of ammonium sulphate (0, 30, 60, 90 and 120 lb. N/ac.), with and without farmyard manure, were studied during 1945–54. The f.y.m. dressing was 100 maunds per ac. [1 m. = 82·3 lb.] Ammonium sulphate alone increased straw and grain yield significantly in all years. Except in 1947 and '51, the maximum increase in grain yield was at 30 lb. N/ac. but, in 1947 and '51, yields continued to increase with increasing N, up to 120 lb./ac. F.y.m. alone did not significantly increase grain yield, except in 1947, but it increased straw yields in 1945, '49, '50 and '54. The maximum grain yield was from ammonium sulphate at 30 lb. N/ac. + f.y.m. This treatment was significantly better than f.y.m. alone, but not better than 30 lb. N/ac. alone. The highest straw yield resulted from ammonium sulphate at 60 lb. N/ac. + f.y.m. Annual applications of ammonium sulphate over 10 yr. had no deleterious effect on yields. The effect

of the treatments on soil structure and composition are described.—A.M.H.

139 Matumura, Y. and Hasida, S. **On the influence of " biuret " upon paddy rice and naked barley.** [Japanese] *Bull. Shikoku Agric. Exp. Sta.* 1957, **3**, 74–83, bibl. 7, illus., English summary.

Biuret [applied as a slowly soluble N fertilizer] had no effect on germination of rice or barley. Rice seedlings can be transplanted without suffering injury if the concentration of biuret is below 45 ppm. Above 50 ppm., growth is checked ; at 250 ppm., the plant is killed. At 100 and 148 ppm., plants recovered after the initial check to their growth ; the straw yield, but not the grain yield, suffered. A concentration of 30–45 ppm. checked the growth of barley, which later recovered, and the yield of straw, but not grain yield, suffered. Concentrations below 10 ppm. had a stimulating effect on early growth of rice and barley. F. Eng. s. —D.B.

140 Hosoda, K. and Takata, H. **Effect of calcium silicate on a paddy rice field on black soil.** [Japanese] *Trans. Tottori Soc. agric. Sci.* 1957, **11**, No. 3, 167–78, bibl. 13, English summary. [Tottori Univ.]

On adding calcium silicate to a soil which had a low silica/alumina ratio, rice yields increased by 14%, but there was no increase when calcium carbonate was added. Available P_2O_5 in the soil, P_2O_5 in the plant and resistance to rice blight were higher in the calcium silicate plot than in the calcium carbonate plot. F. Eng. s.—D.B.

141 Subido, P. S. and others. **The effect of different soil conditioners upon the yield of rice.** *Philipp. J. Agric.* 1955, **20**, No. 3–4, 125–30, bibl. 6. [Bur. Pl. Industr., Philipp. Dep. Agric., Manila] [Received September, 1958]

142 Umali, D. L. and others. **Effects of certain storage factors on the milling recovery of Milfor 6 (2).** *Philipp. Agriculturist* 1958, **42**, Nos. 2 and 3, 60–9. [Cent. Exp. Sta., College, Laguna, Philippines]

Rough rice of the variety Milfor 6 (2) at 13·6 and 11·5% moisture content milled after 8 months' storage yielded about 7% more milled rice than did stored rough rice with 19·8 and 17·5% moisture, and 3–4% more than stored rough rice with 15·7 or 9·8% moisture. Storage for a further 2 months had no effect on milling yield. F.s.—R.B.

143 Hogan, T. T. **Report to the Government of Paraguay on the rice processing industry.** *Rep. 744 FAO* 1957, pp. 27.

This report results from a request by the Government of Paraguay to FAO for advice in improving the drying, storing and processing of rice. Some information is given on rice-growing in Paraguay which started in 1912. Rice is now a basic crop in that country, and there are plans to augment its area.—E.B.O.

144 Director of Agriculture, British Guiana. **Annual report for the year 1955.** Georgetown, 1958, pp. 62 + iii.

Rice variety trials, pp. 29–30. In one trial, the yield of family 19 (2594 lb./ac.) was significantly greater than that of family 21 (1945 lb./ac.). In a 2nd trial, family 115 gave markedly superior yields to families 79, 19 and 21, both in broadcast and transplanted trials. Transplanting delayed flowering by 3–14 days. Experiments on the Japanese method of cultivation, pp. 30–2. Nursery treatment affected yields as follows : wet, unfertilized nursery, 2062 lb./ac. ; raised Japanese nursery (receiving 82 lb. compost, 1 lb. ammonium sulphate and 1 lb. superphosphate/100 sq. ft.) 1363 lb./ac. ; wet, fertilized nursery, 2049 lb./ac.—A.M.H.

GENERAL

145 Boekholt, K. Zur Frage der Drillweite im Getreidebau. [**Drill width in cereal cultivation.**] *Z. Acker- u. PflBau* 1958, **105**, No. 4, 395–408, bibl. 13, map.

The literature on distance between drill rows is discussed. A map has been produced, based on replies from a questionnaire, showing the distribution of drill widths in W. Germany ; they vary between 12 and 20 cm. 16–18 cm. is the most frequent drill width.—D.B.

146 Dadd, C. V. and Osborne, L. W. **Factors influencing the choice of cereal varieties.** *Outlook on Agric.* 1958, **2**, No. 1, 3–12, bibl. 32, illus.

The influence of varietal characteristics, and of sources of information, on the adoption by farmers of new cereal varieties is discussed.—A.M.H.

147 Caldwell, R. M. and others. **Small grain varieties for Indiana. Recommendations for 1958 and performance, 1953-57.** *Res. Bull. 658 Purdue Univ. Agric. Exp. Sta.* 1958, pp. 20, illus.

148 Brady, J. J. **Cereal variety trials at the Department's schools in 1954 and 1955.** *J. Dep. Agric. Republ. Ire.* 1956–57, **53**, 119–50.

Dates of ear-emergence and ripening, yields, bushel weights and 1000-grain weights are tabulated. Spring wheat trials, 1954. (1) Progress, Kärn II, Atson and Koga II significantly outyielded Atle at one centre and Koga II gave the highest yield at a second centre. (2) A.R.A. 52/3/3/3 yielded most at one centre, and Atle, A.R.A. 6/1 × Atle and R.M.D.5 × Bersee No. 4 yielded significantly more than Alexander and

A.R.A. 52/3/3/3 at another. Spring wheat trials, 1955. Atle, Svenno and Peko significantly outyielded Koga II. Oat trials, 1954. (1) Rex, Sun II and Glasnevin Triumph yielded significantly more than S84 and Craigs Afterlea. (2) Pendek outyielded Blenda and Bonstar. Potato-oat trials, 1954. (1) Mass Selection D. gave the highest yields, significantly greater than those of Glasnevin Potato, the lowest yielder. (2) B.4. and Potato (Ardee) outyielded DB.10, D.32 and A.20. Oat trials, 1955. Pendek yielded significantly more than any other variety tested and Craigs Afterlea significantly less. Barley trials, 1954. (1) There were no significant yield differences at one centre, and, at another, S.A.K. 33 yielded significantly more than other varieties. (2) S.A.K. 102 gave a significantly higher yield than S.A.K. 17/9, the lowest yielder. (3) Beorna and S.A.K. 139 outyielded S.A.K. 104 and Herta. Barley trials, 1955. (1) There were no significant yield differences between Herta, S.A.K. 22/11, S.A.K. 115, S.A.K. 54, S.A.K. 33 and S.A.K. 17/8. (2) S.A.K. 131, S.A.K. 22/8, Proctor and Beorna yielded significantly more than S.A.K. 102 and S.A.K. 95. (3) S.A.K. 17/8 gave a significantly higher yield than S.A.K. 22/11, the lowest yielder.—A.M.H.

149 FAO. **Minimum seed certification standards for cereals in the Near East.** *Publ. 58/3/1822 FAO* 1958, pp. 9.

150 Tempe, J. de. **Three years of field experiments on seed-borne diseases and seed treatment of cereals.** *Proc. internat. Seed Test. Ass.* 1958, **23**, No. 1, 38–67, bibl. 4, illus. [Dutch Govt Seed Test. Sta., Wageningen]

This is a fuller version of the paper reported in *Fld Crop Abstr.* 11 : 1534.

151 Portères, R. Les appellations des céréales en Afrique. [**The names given to cereals in Africa.**] *J. Agric. trop. et Bot. appl.* 1958, **5**, No. 1–3, 14–34 and No. 4–5, 311–64, bibl. 233.

Information is given on the history, ethnobotany and names given to barley, wheat, rye and oats in Africa.—E.B.O.

152† Kubo, A. **On the artificial pollen-grain germination of Gramineae. 1. *Triticum vulgare* Vill.** *J. Sci. Hiroshima Univ.* 1956, **7**, No. 2, 103–18, bibl. 23, illus. [Bot. Inst., Hiroshima Univ., Japan]

153† Watanabe, K. **The stigma reaction. 3. Withering of the stigma by pollination in gramineous plants.** *Bot. Mag. Tokyo* 1958, **71**, 838, 138–43, bibl. 9, illus. [Fac. Agric., Kyoto Univ., Japan]

Pollinated stigmas of barley, wheat, maize, rye and rice were studied microscopically. Withering begins at the point of attachment of the pollen grain to the stigma and spreads throughout the length of the style. This withering is attributed mainly to an increase in the permeability of pollinated stigma cells.—D.B.

154 Stroun, M. Photostade et spectrostade. [**Photostage and spectrostage.**] *Physiol. Plant.* 1958, **11**, No. 3, 548–63, bibl. 22, illus., English summary. [Bot. Inst., Univ. Geneva, Switzerland]

The term photostage is defined as that growth stage during which daylength is the primary factor determining flowering in plants, and the spectrostage as that growth stage which succeeds the photostage and during which the wavelength of light, rather than daylength, exerts the greatest effect on flowering. The experiments reported were carried out to determine the duration of the photostage and spectrostage in long-day cereals (wheat, barley and rye). The data given refer exclusively to wheat and barley, though experiments with rye were also carried out and the results supported those obtained with wheat and barley. The photostage was found to last from the end of vernalization to the time of spikelet differentiation. The spectrophase lasted from the time the spikelets were differentiated to the organogenesis of stamens and pistils (gonadogenesis). During the spectrostage, light of long wavelength favoured plant development. During gametogenesis, light intensity was the dominating factor. It was concluded that the respective durations of photostage and spectrostage were specific.—P.J.B.

155 Fritzsch, K. Über die Eignung von spurenelementhaltigen Beizmitteln zur Behebung vorwiegend leichter Mangelerscheinungen. [**Seed protectants containing trace elements for correcting trace-element deficiency.**] *Z. PflKrankh.* 1958, **65**, No. 6, 321–9, bibl. 5, English summary. [Inst. PflSchutz, Landw. Hochsch., Stuttgart-Hohenheim and PflSchutzamt, Hannover, W. Germany]

The effect was studied of seed treatment with dynamal, a seed protectant containing Cu, Mn and B, as well as Hg, on the growth and yield of cereals. In demonstration plots in North Hannover district it was evident that, compared with albertan (a seed protectant containing Hg without trace elements), dynamal improved the vegetative growth of cereals in 45% of the trials. It had no influence on the remaining 55%. Grain yields were 90 kg./ha. higher than after treatment with albertan and 150 kg./ha. higher than after no seed treatment. These yield increases were statistically significant.—D.B.

156 Caldwell, F. **Some notes on dormancy of cereal grains.** *Agric. hort. Engng Abstr.* 1958, **9**, No. 3, 189–92, bibl. 21.

This is a review article.—A.M.H.

157† Grosse-Brauckmann, E. Über den Einfluss hoher Kieselsäuregehalte im Getreidestroh auf die Bestimmungen von Calcium, Magnesium, Kalium and Natrium. [**The effect of high SiO_2 content of cereal straw on the determination of Ca, Mg, K and Na.**] *Landw. Forsch.* 1958, **11**, No. 2, 105–8, bibl. 6, English and French summaries. [Agrik. Chem. Inst., Univ. Bonn, W. Germany]

Examples are given which show that SiO_2 can mask the true mineral content of cereal straw. With a high SiO_2 content, the results of analyses by the usual method may fall short of their true values by as much as 16% CaO, 17% MgO, 11% K_2O and 25% Na_2O. F. s.—D.B.

158 Hood, A. E. M. **Nitrogen fertilizers and the newer cereal varieties.** *Chem. and Industr.* 1958, No. 25, 751.

Trials at Jealott's Hill and elsewhere have shown that, even under high-fertility conditions, stiff-strawed cereal varieties gave economic responses to applications of about 70 lb. N/ac. Dressings in late May were sometimes too late to give maximum response. Over 4 years, the response to 70 lb. N/ac. from winter wheat following 3-year leys varied from 3·9 to 14·1 cwt. grain/ac. and averaged 8·4. Spring wheat, oats and barley varieties (e.g. Atle and Koga II ; Blenda and Palu ; Proctor and Rika) grown as third cereals after ley, gave average responses to 70 lb. N/ac. of 7·5, 10·7 and 10·7 cwt. grain/ac., respectively.—E.B.O.

159 Schallock, D. A. **Response of small grains to supplemental nitrogen and clipping treatments.** *Diss. Abstr.* 1958, **19**, No. 2, 205. [Rutgers Univ., New Jersey]

Winter- and spring-cereals [crops not named] were fertilized at sowing with 100 lb. each of P_2O_5 and K_2O. N was applied at 30 and 60 lb./ac. either as an aqueous solution of urea and NH_4NO_3 or as solid NH_4NO_3. Winter cereals responded significantly to N treatments, except under extremes of heat and drought. N in solution caused more rapid forage growth of some crop varieties, but similar yields of grain and straw were achieved with either source of N. Spring oats yielded badly and did not respond well to N. Clipping treatments to simulate grazing were carried out on winter cereals in autumn or spring. Spring clipping caused considerable reduction in grain yield ; autumn clipping caused some reduction but prevented or diminished winter-killing. Applied N promoted winter-killing.—R.B.

160 Schmitt, L. and Brauer, A. Vergleich verschiedener Erntemethoden bei Getreide-Feldversuchen. [**A comparison of different harvesting methods in field experiments with cereals.**] *Landw. Forsch.* 1958, **11**, No. 1, 1–9, illus., English and French summaries. [Landw. Versuchsanst., Darmstadt, W. Germany]

A method for determining yields of cereals by threshing samples from a plot (Wagner's technique) instead of the whole plot is described. The sampling units are handfuls of ears ; sufficient are taken, by random sampling, to make a sample of 6–8 kg. This is weighed, bagged and removed to the experiment station where it is threshed, and the cereal yield is calculated from plot data. The method is advantageous for experiments on farmers' fields some distance from an experiment station. Since cutting, sampling and removal of the sample to the experiment station are done on 1 day, variations in humidity of the air do not affect the result. In the five 2-yr. trials considered in this paper, the yield calculated from threshed samples was 9% higher than by threshing the entire plot. Provided sufficient random samples are taken by trained workers and given an adequate number of replications, Wagner's technique is more convenient and more accurate than threshing the entire plot. Analysis of variance showed very good agreement between the 2 methods for the estimation of differences in yield caused by treatment and by differences between blocks. It is concluded that Wagner's technique is a reliable alternative to the entire-plot technique.—D.B.

161 Kreyger, J. Drogen van akkerbouwprodukten. [**Drying of field-crop produce.**] *Publ. Ser. A No. 20 Inst. Bewaring en Verwerking v. LandbProdukten, Wageningen* 1958, pp. 75.

This paper is a survey of the principles and practice of crop drying, with special reference to pulses, also threshed and unthreshed barley, oats, rye and wheat for consumption or for seed.—R.B.

162 Ingold, M. Le séchage des céréales. [**The drying of cereals.**] *Rev. rom. Agric.* 1958, **14**, No. 8, 61–3, bibl. 4, illus. [Sta. Féd. Essais Agric., Lausanne, Switzerland]

An installation for drying cereal grains by forced ventilation during periods of low air-humidity is described. This method, for which heat is not required, is economic when the quantity of grain does not justify the use of a grain drier.—D.B.

163 Schribaux, P. Conservation des céréales. Grain sain et thermodynamique. [**Cereal storage. Sound grain and thermodynamics.**] 2nd edn, 1956, pp. 61, illus. [Office Nat. Céréales, Minist. Agric. France] [Received Aug.,1958]

This lecture given at the Institut National Agronomique in May, 1955, deals with the bulk storage of grain by means of ventilation.—E.B.O.

164 Ramírez, G. M. and Barnes, D. Los insectos y sus daños a los granos almacenados.

[Insects and their damage to stored grain.] *Fol. misc. 6 Sec. Agric. Ganad., Méx.* 1958, pp. 39, bibl. 9, illus., English summary.

Chemical measures are described.—E.B.O.

165 Ministry of Agriculture, Fisheries and Food, England and Wales. **Insects and mites in farm-stored grain.** *Adv. Leafl. 368 Minist. Agric., Fish., Fd, England and Wales* 1958, pp. 8, illus.

The importance of suitably constructed buildings, regular cleaning and inspection, rotation of stocks, suitable stacking arrangements and correct grain-moisture contents is stressed. Methods are described for treating infested grain by heat, fumigants and insecticides and for treating barns, bins, etc. with insecticidal dusts, sprays or smokes. —A.M.H.

LEGUMES

COWPEAS

166† Purss, G. S. **Studies on varietal resistance to stem rot (*Phytophthora vignae* Purss) in the cowpea.** *Qd J. agric. Sci.* 1958, **15,** No. 1, 1–14, bibl. 2, illus. [Pl. Path. Branch, Div. Pl. Ind., CSIRO]

The reaction of 34 varieties of cowpeas to *P. vignae* in pot tests and nursery plots, and of some of these varieties in field trials, is described. Twelve other legumes tested were resistant. The cowpea varieties tested could be placed in 3 groups : (a) completely susceptible, e.g. Poona and Reeves ; (b) showing moderate field resistance, depending on conditions, e.g. Malabar, Giant and Cristaudo, the last of which was very susceptible at a high inoculum level ; (c) resistant, e.g. Blackeye 5 and Havana. The resistance of Blackeye 5 was dominant to susceptibility.—A.M.H.

167 Caswell, G. H. and Clifford, H. T. **Effect of fumigation and moisture content on the seedling growth of cowpea (*Vigna unguiculata*).** *Nature, Lond.* 1958, **182,** No. 4634, 540–1, bibl. 1. [Univ. Coll., Ibadan, Nigeria]

The adverse effect on seedlings of fumigation (recorded for maize grain in *Fld Crop Abstr.* 10 : 503) has been produced on cowpea seedlings by fumigating the seed "with a 1 : 1 mixture of carbon tetrachloride and ethylene dichloride at a concentration of 20 cm.^{3} of total storage volume." The effect of the fumigation was more noticeable in seedlings from seeds with 12% moisture content than those from seeds with 10% moisture.—M.H.

SOYABEANS

See also Abs. 356, 398

168 Guyot, S. Productivité américaine : le cas du soja. **[American productivity : soyabean (in the USA).]** *Oléagineux* 1958, **13,** No. 6, 515–23, No. 7, 595–601 and No. 8–9, 685–92, bibl. 20, illus.

169 Lanza, F. Prove di adattamento e resa di sei cultivar di soia. **[Adaptation and yield trials with six soyabean cultivars.]** *Publ. 128 Ann. Sta. chim.-agr., Roma Ser. 3,* 1956–7, pp. 22, bibl. 13.

In trials over 3 years near Rome with the soyabean cultivars Roanoke and Ogden (both late), Blackhawk, Kisa and J.S. 8 (all medium) and Flambeau (early), all from North America, the possibility of developing soyabean-growing in Italy was investigated. Although results were not definitive, it is thought that soyabeans are more suitable as a second crop (sown in May-June) under irrigation in southern Italy, than as a principal crop, and that medium or late varieties would be preferable to early ones.—E.B.O.

170 Freeman, J. F. and others. **Results of the Kentucky soybean variety performance and fertilizer tests 1957.** *Progr. Rep. 64 Kentucky Agric. Exp. Sta.* 1958, pp. 8, 1 map.

Recommended soyabean varieties for N. and E. Kentucky are Clark, Wabash and Lincoln, and for S. and W. Kentucky, Clark, Perry and Ogden. —R.B.

171 Meade, J. A. and Santelmann, P. W. **Pre- and post-emergence weed control in soybeans.** *Proc. 12th N.E. Weed Contr. Conf.* 1958, 188–93. [Maryland Agric. Exp. Sta., College Park]

In trials in Maryland during 1957, alanap, CDAA, CDEC, dinoseb, neburon, CIPC, emid (2,4-dichloroacetamide), EPTC, simazin, 2,4-D, 2,4-DB and PCP were applied as pre-emergence treatments. On light soils, alanap gave good weed control ; on heavier soils, results were less satisfactory. CDAA, CDEC and CIPC gave good control of grass weeds, but control of broad-leaved weeds was variable. CDAA was less effective than CDEC or CIPC. 2,4-D, emid and 2,4-DB gave good control of grasses with no lasting injury to the soyabeans. Simazin at 1·5 and 3 lb./ac. gave good weed control, but injured the soyabeans, particularly at the 3 lb./ac. rate. EPTC, PCP and dinoseb also gave good weed control. Dinoseb applied as a post-emergence treatment at a rate of 1·5 lb./ac. at the emergence and single-leaf stages gave good weed control, with no reduction in soyabean yields ; treatments applied at the cotyledon, 1st and 2nd trifoliate-leaf stages reduced soyabean yields.—P.J.B.

172 Bach, M. K. and others. **Translocation of photosynthetic products to soybean nodules and their role in nitrogen fixation.** *Pl. Physiol.* 1958, **33,** No. 2, 118–24, bibl. 22, illus. [Wisconsin Univ., Madison]

The tops of soyabean plants were exposed to $^{14}CO_2$ and the plants harvested after 10 hours' daylight or after a further 9 hours' darkness. Distribution of ^{14}C among root- and nodule-organic acids, amino-acids and carbohydrates was determined, as well as metabolic changes during darkness. During the day, the ^{14}C% of the root organic acids was nearly twice that of the amino-acids ; the position was reversed in the nodules. After night metabolism, the ^{14}C in organic acids had decreased in the roots but increased in the nodules, while the amino-acids-^{14}C content was almost unchanged in the roots and halved in the nodules. This drop may have been due to conversion into proteins when there was little fixation to replenish the levels. The lack of a specific organic acid as an N-acceptor may have been limiting. Fractionation of the organic acids revealed unidentified fractions and showed interesting changes between day and night organic-acid contents in roots and nodules, including the complete disappearance of one unidentified fraction during the night. No changes were found in the ^{14}C distribution between amino-acid fractions from day to night. Chromatographic analyses indicated changes in certain sugars and disclosed the presence of unidentifiable sugars. The demonstration of highly radioactive carbohydrates in nodules prompted an examination of their influence on nitrogen fixation by nodule slices. Glucose, fructose and sucrose had similar enhancing actions on nitrogen fixation, with optimal concentrations between 0·005 and 0·02M.—M.H.F.

GROUNDNUTS

See also Abs. 350, 457, 483, 494

173 Singh, M. P. and Amarnath Lala. **Cultural and manurial studies in groundnut and castor.** *Indian Oilseeds J.* 1958, **2**, No. 2, 82–8, bibl. 1.

In the State of Bihar, the normal spacing for groundnuts (*Arachis hypogaea*) is 1 ft. × 2 ft. between plants and rows, respectively. In spacing trials at 3 locations the highest pod yield (mean = 1646 lb./ac.), obtained from a spacing of 6 in. × 1 ft., was 18·3% above the yield from the normal spacing and the net profit 50% greater. In all spacings, the crop was grown both ridged and flat. Flat cultivation gave the higher yield.—D.B.

174 Singh, Dharampal and Singh, D. N. **Effect of time of digging on yield and quality of groundnut.** *Indian Oilseeds J.* 1958, **2**, No. 2, 75–81. [Kesarwa (Budaun), Uttar Pradesh]

Yields of groundnuts (*Arachis hypogaea*) are higher in Uttar Pradesh than in other states, but the quality of nuts is poor. The effect of digging at 90, 100, 110 and 120 days after sowing on the quality of nuts of early- and late-varieties was investigated. Early varieties attained their highest oil yield when harvested 110–120 days after sowing. Late varieties (which eventually give a higher oil yield) were far below their potential oil-production 120 days after sowing. For them, 135 days are probably required. The present practice of sowing groundnuts in July allows a period of only 120 days before harvesting the crop (allowing time for clearing the land for the winter crop). Since the evidence suggests that the low quality of nuts is caused by premature harvesting, farmers are recommended to sow in June and to practice irrigation wherever possible. The alternative is to develop early-maturing varieties which can compete with the late-maturing varieties in oil yield.—D.B.

175 Raman, V. S. **Studies in the genus *Arachis*. 4. Hybrid between *A. hypogaea* and *A. monticola*.** *Indian Oilseeds J.* 1958, **2**, No. 3, 20–3, bibl. 9, illus. [Agric. Res. Inst., Coimbatore]

Hybrids obtained from crossing 2 tetraploid species of groundnut, *A. hypogaea* and *A. monticola*, were fertile. They were more vigorous than the parents, had larger leaves and flowers, longer internodes and petioles and a more spreading habit.—D.B.

176 Raman, V. S. **Studies in the genus *Arachis*. 2. Chromosome numbers of certain species of *Arachis*.** *Indian Oilseeds J.* 1958, **2**, 72–3, bibl. 12. [Agric. Coll. and Res. Inst., Coimbatore]

177 Raman, V. S. and Nagarajan, S. S. **Studies in the genus *Arachis*. 3. Polyembryony in the ground-nut (*Arachis hypogaea* Linn.).** *Indian Oilseeds J.* 1958, **2**, No. 2, 74, bibl. 2. [Agric. Coll. and Res. Inst., Coimbatore]

178 Oakes, A. J. **Pollen behavior in the peanut (*Arachis hypogaea* L.).** *Agron. J.* 1958, **50**, No. 7, 387–9, bibl. 7. [Dep. Genet., Texas Agric. Exp. Sta., College Station, Texas]

The viability of groundnut (var. Spantex) pollen was determined by germination tests on a culture medium. The duration of viability was determined by storing pollen in whole flowers under controlled conditions until its viability approached zero. The rate of pollen growth within the style was determined. Germination % increased as the temperature rose from 65 to 86°F., but decreased as it rose from 86 to 95°F. No germination was observed below 65°, or above 95°F. Significant differences in viability were found between samples of pollen collected at different stages of physiological development. Pollen viability was highest in samples collected at 5 a.m. and 7 a.m. Pollen was kept successfully for several days in an ordinary household refrigerator.

That collected at 7 a.m. remained viable for 8 days when stored in whole flowers at 45°F. in open vials over $CaCl_2$ in dessicators. Pollen collected at 3 a.m., 5 a.m. and 9 a.m. remained viable for 6 days when stored under similar conditions. The growth-rates of pollen tubes grown in a sugar-agar medium increased from 0·5 to 1·8 mm./hr. as the temperature increased from 75° to 90°F. Anthesis of pollen and pollination occurred between 5 and 6 a.m. Fertilization took place 8–9 hr. after pollination. F.s.—A.M.H.

179 Bailey, W. K. and others. **Influence of temperature on the after-ripening of freshly harvested Virginia Bunch peanut seeds.** *Proc. Amer. Soc. hort. Sci.* 1958, **71**, 422–4, bibl. 2. [U.S. Dep. Agric., Beltsville, Maryland]

The dormant period of Virginia Bunch 67 groundnut seeds was about 40 days when the seeds were held at 30°C. It was shortened to 15 days by holding the seeds at 40–50°C. F. s.—A.M.H.

180 Bunting, A. H. **A further note on the classification of cultivated groundnuts.** *Emp. J. exp. Agric.* 1958, **26**, No. 103, 254–8, bibl. 1.

The general classification of cultivated groundnuts previously presented [*Fld Crop Abstr.* 9 : 820] has been somewhat modified. The new observations deal with : the subdivision of the alternately branched forms, particularly of the former *Matevere* group ; the status of certain varieties previously assigned to the Valencia group ; the resemblances between the groups. A few new groups have been added in the sequentially branched section, and some cases of anomalous branching are recorded. The key to the groups in the Tozi collection is revised. F. s.—A.M.H.

181 Ollagnier, M. and Prevot, P. Expérimentation sur le phosphate bicalcique et le phospal. Résultats obtenus en 1956 et 1957 sur l'arachide. [**Trials with bicalcium phosphate and phospal. Results obtained in 1956-7 with groundnuts.**] *Oléagineux* 1958, **13**, No. 7, 589–94, bibl. 1, English summary. [Inst. Rech. Huiles et Oléagineux, Paris]

The results from trials with groundnuts in Senegal showed that bicalcium phosphate has a quicker, more important and more constant effect on yields than tricalcium phosphate and phospal (a calcinated aluminium phosphate from Senegal). In regions of high rainfall (800 mm. per year), however, part of the bicalcium phosphate may be replaced by phospal which, when applied at high rates, has a strong residual effect.—E.B.O.

182 Rao, S. D. Thirumala and Murti, K. S. **Storage studies of groundnuts at room and constant low temperatures.** *Indian Oilseeds J.* 1958, **2**, No. 2, 112–18, bibl. 11. [Oil Technol. Inst., Anantapur]

The behaviour of the Coromandel variety of groundnuts (*Arachis hypogaea*) when stored as kernels, and also in the pod, at laboratory temperature (56–107°F.) and low temperature (40 ± 2°F.) was studied for 1 yr. Samples, removed fortnightly or monthly, were analysed for moisture content, oil content, free-fatty-acid content and refinability of the oil. The oil content, whether stored at laboratory- or low-temperature, remained constant during the year. The free-fatty-acid content (the major factor influencing loss of refinability) increased with length of storage period and was highest in the free kernels stored at laboratory temperature ; it was negligible in the unshelled kernels stored at low temperature.—D.B.

183 Duerden, J. C. **The storage of groundnuts under tropical conditions. 2. The effects of storage in paper sacks.** *J. Sci. Fd Agric.* 1958, **9**, No. 8, 483–7, bibl. 2. [W. Afr. Stored Products Res. Unit, Nigeria]

[See also *Fld Crop Abstr.* 11 : 1089.] Laboratory trials and open-air field tests showed that the storage of uninfested groundnuts in paper sacks preserved quality and reduced losses to a greater extent than did storage in hessian sacks. Groundnuts previously infested, mainly by *Tribolium castaneum*, showed lower quality and greater losses in weight in paper sacks than in hessian containers. Paper sacks with a sleeve valve for filling were more proof against insects than were open-mouthed paper sacks and both types were particularly successful when situated either in the upper layers or in the interior of a stack in the open air. F.s.—A.M.H.

PEAS

See also Abs. 370, 371, 372, 373

184 Dadd, C. T. V. **The pea crop—a review.** *Agric. Rev., Lond.* 1958, **4**, No. 3, 24–30.

The pattern of utilization of the pea crop in Britain, sowing conditions and seed rates, fertilizers, chemical and cultural methods for weed control, pests and diseases, and harvesting are discussed.—A.M.H.

185 Proctor, J. M. **A swift furrow and a light harrow.** *Fmr's Wkly, Lond.* 1958, **49**, No. 8, 85, illus.

The seed-bed requirements of peas in England are discussed in relation to the weather.—C.L.S.

186 Luchini, R. Il pisello per l'industria conserviera argentina. Sgranatura sul campo e insilaggio delle piante per il bestiame. [**Peas for canning in Argentina. Shelling in the field and ensiling the plants for cattle-feed.**] *Riv. Agric. subtrop.* 1958, **52**, No. 4–6, 223–46, bibl. 8, illus., English summary.

Information is given on peas (*Pisum sativum*)

for canning, particularly on their climatic- and soil-requirements, manuring, rotations and harvesting, with a view to improving this crop in Argentina. The main problems are concerned with harvesting, shelling, and ensiling the haulms and empty pods. The production of fresh peas in Argentina is 42,200 metric tons from 14,620 ha. The climate in Buenos Aires and Santa Fé Provinces, the principal regions of production, is not very suitable for growing green peas as the spring temperature is often too high. It is thought that the growing of this crop could be developed in the more southern regions of Argentina, wherever the climate is favourable.—E.B.O.

187 Joubert, T. G. la G. **A new pea variety —Satellite T.P.** *Fmg in S. Afr.* 1958, **34**, No. 4, 30–1, illus. [Hort. Res. Sta., Pretoria]

The characteristics of the variety Satellite T.P. (Black-eyed Susan × Asgrow No. 40) are described. In 1955 and '56 it yielded an average of 6·3 bags [1 bag = 200 lb.] dry seeds per morgen [1 morgen = 2·1165 ac.] more than the standard variety Rondo.—A.M.H.

188 Zogg, H. Bekämpfung von Samenunkräutern im Drescherbsenanbau. [**Control of weed seedlings in fields of canning peas.**] *Mitt. schweiz. Landw.* 1958, **6**, No. 4, 60–4. [Eidg. Landw. Versuchsanstalt, Zürich-Oerlikon]

Two recently developed methods for the control of weeds in a canning-pea crop are given : (1) calcium cyanamide is dusted at 2 kg./a. when the peas are 2–5 cm. high and the weeds not beyond the 2-leaf stage ; (2) dinoseb is sprayed as BNP 20 (0·6% in 1000 l./ha.) or as sevtox (0·5% in 1000 l./ha.) when the peas are 5–20 cm. high and the weeds not beyond the 2- to 4-leaf stage. The precautions which must be taken when using herbicides (1) and (2) are listed.—D.B.

189 Chemistry and Industry. **Maturation and germination of peas.** *Chem. and Industr.* 1958, No. 17, 486–8.

Summaries are given of papers presented to a symposium organized by the Low Temperature Research Station in collaboration with the Fruit and Vegetable Canning and Quick Freezing Research Association, held in Cambridge in June, 1957.—E.B.O.

190 Bonde, E. K. and Moore, T. C. **Effects of gibberellic acid on the growth and flowering of Telephone peas.** *Physiol. Plant.* 1958, **11**, No. 3, 451–6, bibl. 14. [Univ. Colorado, Boulder]

In glasshouse trials, 10- and 20-day-old seedlings of dwarf and tall strains of Telephone peas (*Pisum sativum*) were sprayed with solutions of the following concentrations of the K salt of GA : 0·0015, 0·015, 0·15, 1·5, and 15 mg./l. These treatments increased stem elongation, the effect being greatest at the highest concentration of GA and in seedlings 20-days old at the time of treatment. Dry weights of seedlings 10- and 20-days old when treated with 15 mg.GA/l. were 108 and 87%, respectively, above those of untreated controls at 64 days after sowing. GA did not affect the time taken to flower in either the dwarf or the tall strain. The number of nodes formed before the first flower increased to a maximum of 2 in the dwarf strain at the highest concentration of GA ; in the tall variety, this factor remained unaffected.—P.J.B.

191† Pate, J. S. **Nodulation studies in legumes. 1. The synchronization of host and symbiotic development in the field pea, *Pisum arvense* L.** *Aust. J. biol. Sci.* 1958, **11**, No. 3, 366–81, bibl. 15. [Queens Univ., Belfast, N. Ire.]

Symbiotic development of *Pisum arvense* vars. New Zealand maple pea and Black-eyed Susan was studied by periodic sampling from populations of field-grown material. Various features of effective symbiosis were found to be characteristically synchronized with host-plant life-cycles. Nodule initiation was complete at the 7-leaf stage of plant development. Peak values in total nodule numbers and nodule/plant-weight ratio occurred at this stage. Later, the regular decline in nodule numbers was offset by large increases in the size and fixation efficiency of the remaining nodules. Well-defined pigment changes occurred in nodule populations. Numbers of young (white) nodules developed during precocious root expansion in the 1-to 3-leaf stages. Haemoglobin was formed in the first-developed nodules on primary roots just before the cotyledon N reserves were exhausted. Maximum total numbers of red nodules were attained at the 6-to-8-leaf stages. The subsequent active (red) life of nodules varied from 8 to 80 days. Senescent (green) nodules accumulated on roots following extensive haemoglobin destruction in the nodules of maturing plants. Average fresh weight per nodule increased some 30-to 50-fold during plant growth. There was a progressive elimination of smaller nodules throughout plant development. Nodule N and haemoglobin concentrations increased together to peak values in mid-vegetative stages. There was a general increase in the fixation efficiency of nodules as the host plants matured. Approximately 30% of the N in the red nodules was removed during early senility. The return of N to the plant from this source was estimated to be less than 3% of the fixation benefit from healthy (red) nodule activity. High rates of transfer of N from nodules to the plants were recorded from red nodules from the 5-leaf stage until flowering. F. S.—A.M.H.

192 Pea-Growing Research Organization, Ltd. **Annual Report 1957.** 1958, pp. 22,

Yaxley, Peterborough : Pea-growing Res. Org. Ltd.

1. Spacing of vining peas, p. 9. The variety Lincoln was sown at a rate of 168 lb./ac. in rows spaced 8, 16 and 24 in. apart, with spacings of 2·4, 1·2 and 0·8 in., respectively, between plants in the row, or at the same spacings between rows, but with a constant distance of 2·8 in. between plants in the row. There were no significant yield differences, but the 8 × 2·4 in. spacing gave the highest yield, followed by the other 168 lb./ac. treatments.

2. Chemical control of wild oats, pp. 12–13. TCA (10 lb./ac.), IPC (6 lb./ac.), CDAA and CDEC (12 lb./ac.) applied about the 3rd week in March adversely affected initial crop growth. TCA applied in February or March, with or without extra seed-bed cultivation, gave excellent control of wild oats. A late-March application of IPC gave better control than a February application.

3. Pea weevil (*Sitona* sp.) control, p. 14. Thimet 44D (1 lb. active ingredient/cwt. seed) caused a 25% decrease in plant emergence. Granular thimet (20 lb. active ingredient/ac.) applied in the drills at sowing gave good control of adults and larvae and increased yield of threshed peas by 2·5 cwt./ac. —A.M.H.

BEANS

See also Abs. 392, 395, 437, 492

193 Soper, M. H. R. **Field beans.** *Minist. Agric., Fish., Fd, England and Wales* 1958, pp. v + 15, bibl. in text, illus., London: H.M.S.O., 1s. 9d.

Information is given on types of field beans, their cultivation, pests and diseases. The practice of growing mixed crops of cereals and beans is discussed.—A.M.H.

194 Riepma Wzn, P. Standruimte-onderzoek bij voor zaad verbouwde tuinbonen (*Vicia faba* L.). [**Spacing of broad beans grown for seed.**] *Meded. 5 Proefsta. Akker Weidebouw* 1957, pp. 12, mimeo.

Experiments (1952–5) with the broad bean varieties Allervroegste [Earliest-of-all] and Verbeterde Witkiem [Witkiem Improved] showed that a heavy sowing rate is necessary, namely, 275–350 kg. per ha., the economic optimum being about 350 kg. per ha. Variations in sowing rate requirements are attributed to the influence of soil type and weather. With the varieties mentioned, the most economic result is usually obtained from a density of 20 plants per sq. m. Broad beans are not sensitive to different drill widths and the farmer has a wide choice of drills, namely, from 33·33 to 57·66 or even 75 cm. With a dense stand the percentage of seed waste is frequently lower than with a thin stand, probably because of the habit of the plants, for, with a smaller number of plants per sq. m. the plant is more compact and shorter and the first pods are set nearer the ground. Tillering is at the same time better, so that more pods are close to or touch the ground, which increases the risk of seed waste. There was little evidence of any clear relation between drill width and seed quality. With increasing density of stand the number of pods per plant decreases regularly. The influence of drill width upon pod-setting is small. A large number of pods per unit area is frequently related to high yield. For optimal yield under the local conditions of soil and climate, 90–110 pods per sq. m. were frequently found to be sufficient, but the final level of yield was also governed by the degree of pod-filling, which can vary with year and place. The influence of spacing upon pod-filling is minimal. The relation of 1000-seed weight to spacing was not clear.—G.M.R.

195† Picard, J. and Berthelem, P. La féverole. [**Field beans.**] *Ann. Amélior. Pl., Paris* 1957, **7**, No. 3, 287–311, bibl. 6, English, Russian and German summaries. [Sta. Amélior. Pl., Dijon, France]

The results are given from investigations at various stations in France, in 1951–6, into the use of field beans (*Vicia faba minor* and *V. faba equina*) for seed- and forage-production. The main conclusions were : (a) for seed production, the spring varieties are more productive, the larger their seeds; they must be sown early at a high seed rate ; the winter varieties now grown are low-yielding ; (b) for forage production, the best time for harvesting for fresh consumption is a little before the end of flowering, and for silage when the seeds of the first pods are well formed. There are no great differences between varieties in dry-matter content, crude-protein content and forage yields, but early varieties, such as Ascott, avoid aphis attacks to a great extent, and thus yield a sound forage ; the winter variety Côte-d'Or, either grown alone or in association with other legumes or winter cereals, yields well and because of its earliness avoids aphis attacks.—E.B.O.

SWORD BEANS

196† Vanetti, F. Ensaio preliminar de contrôle ao gorgulho das vagens do "feijão de porco" *Sternechus tuberculatus* Boheman, 1836. [**Preliminary trial in controlling the pod weevil (*S. tuberculatus*) on sword bean.**] *Ceres, Minas Gerais* 1958, **10**, No. 58, 317–23, bibl. 5.

In Minas Gerais State, Brazil, the weevil *Sternechus tuberculatus*, is a pest of sword bean (*Canavalia ensiformis*), one of the best green manures. A plot trial to control this pest was carried out in a field of sword beans grown for seed. The results showed that BHC and dieldrin, both at 0·03 active principle, applied as sprays (8 applications), gave

the best control (7 and 11% of bored seeds, respectively, compared with 22% in the untreated controls.)—E.B.O.

LUPINS

See also Abs. 372, 450, 452

197† Schulz, K. Der Einfluss der Grösse des Samenkorns auf Entwicklung und Ertrag bei *Lup. albus*. [**The influence of size of seed on development and yield of *Lupinus albus*.**] *Z. Acker- u. PflBau* 1958, **106**, No. 2, 224–44, bibl. 14, illus. [Inst. Acker- u. PflBau Müncheberg, E. Germany]

The influence of size of seed of *L. albus* on plant growth was clearly shown in these experiments. Compared with plants from the small seeds (1000-grain weight, 175–375 g.), plants from the larger seeds (1000-grain weight, 425–625 g.) had a higher percentage emergence and greater plant vigour, as sown by the percentage of plants persisting to maturity ; they were also taller, flowered earlier and produced a higher seed yield. There was a close relationship between seed yield and weather, especially the rainfall about the end of May and beginning of June which was important for seed setting.—D.B.

198† Burns, R. E. and others. **Factors affecting the longevity of blue lupine seed.** *Publ. ARS 34–5 U.S. Dep. Agric.* 1958, pp. 5. [Georgia Agric. Exp. Sta., Experiment]

Dry seed of *Lupinus angustifolius* was more susceptible to damage during combine-harvesting than was seed with a higher moisture-content. Lupin seed with a high moisture-content and containing appreciable quantities of green chaff was less susceptible to damage by spontaneous heating when the seed was cleaned immediately after harvesting. High drying-temperatures tended to reduce the germinating capacity of seed of high moisture-content. Drying temperatures of 110–120°F. were recommended. Dry seed was damaged by rough handling ; during storage damaged seed lost viability more rapidly than undamaged seed. Seed containing 14·5% moisture began to decline in viability after storage for 3 months at 86°F. and after 6 months of storage at 68 or 77°F. Seed stored at 13·5% moisture did not deteriorate during 2 yr. of storage. The moisture content recommended for successful storage is 12%.—R.B.

LENTILS

199 Singh, Dharampal. **Cultivation of lentil in Uttar Pradesh.** *Tech. Bull. 1 Bur. agric. Inf., U.P.* 1957, pp. 12.

An account is given of the varieties, cultivation, breeding, diseases, food value, and marketing of lentils [*Lens esculentum*] in Uttar Pradesh.—D.B.

200 Luca, Y. de. Contributions à l'étude morphologique et biologique de *Bruchus lentis* Fröhl. Essais de lutte. [**Contributions to the morphological and biological study of *B. lentis*. Control trials.**] *Ann. Inst. agric. Algér.* 1956, **10**, No. 1, 3–94, bibl. 44, illus. [Received June, 1958]

An insecticidal treatment with a phosphoric ester, applied at the rate of 200–250 g. of toxic principle per ha. 10–20 days after the beginning of flowering, controlled effectively and economically *B. lentis* on lentils in Algeria.—E.B.O.

201 Pilet, P.-E. Action de l'acide β-indolylacétique, à diverses températures, sur la croissance des racines et la formation des radicelles du *Lens*. [**Effect of β-indolacetic acid, at different temperatures, on the growth of roots and the formation of rootlets in *Lens culinaris*.**] *Phyton* 1957, **8**, No. 1, 13–20, bibl. 33, English summary. [Inst. Bot., Univ. Lausanne, Switzerland]

GENERAL

202 Savile, A. H. and Wright, W. A. **Notes on Kenya agriculture. 3. Oil seeds, pulses, legumes and root crops.** *E. Afr. agric. J.* 1958, **24**, No. 1, 1–9.

Notes are given on climate, soils, cultivation and harvesting methods and major uses for the following legumes : bonavist bean (*Dolichos lablab*), soyabean, sword bean (*Canavalia ensiformis*), jack bean (*C. gladiata*), velvet bean (*Stizolobium niveum*), lupins, chick pea (*Cicer arietinum*), cowpea (*Vigna catiang*), pea, pigeon pea (*Cajanus indicus*), and Bambarra groundnut (*Voandzeia subterranea*). Spacings, seed-rates, yields per ac. and time to maturity are tabulated for each crop. [See also Abs. 302 and 350.]—A.M.H.

203† Botton, H. Les plantes de couverture. Guide pratique de reconnaissance et d'utilisation des légumineuses en Côte d'Ivoire. [**Cover crops. A practical guide for the identification and utilization of legumes in the Ivory Coast.**] *J. Agric. trop. et Bot. appl.* 1957, **4**, No. 12, 553–616, and 1958, **5**, No. 1–3, 45–172, bibl. 47, illus.

The object of this paper was to collect together information, scattered in the literature, on the legumes used as cover crops in French West Africa, particularly the Ivory Coast. The species considered are those grown for cover in association with a crop, as well as those grown as catch crops for green manure, and those grown during a fallow. The same species can, however, have more than one use. The classification of the legumes leads to the identification of the genera and species of interest. These are described and notes are given on their use for cover, green manure and, wherever possible, for fodder. The drawings, a main feature of the work, are by N. Halle.—E.B.O.

ROOT CROPS

SUGAR-BEET

See also Abs. 353, 357, 436

204 Heinisch, O. Der Einfluss der Bestandesdichte auf Ertrag und Qualität der Zuckerrübe. [**The influence of density of stand on yield and quality of sugar-beet.**] *Dtsch. Landw.* 1958, **9**, No. 6, 268–72, bibl. 14. [Inst. PflZücht. Kleinwanzleben, E. Germany]

The data produced in this review focus attention on the reduction in yields of beets and sugar per ha. with wider spacing of plants. For conditions in E. Germany, the usual stand density of 60,000–75,000 plants per ha. at harvest is too low. A density of at least 80,000 and preferably 90,000–100,000 is recommended.—D.B.

205 Boyd, A. E. W. **Sugar beet strangles.** *Brit. Sug. Beet Rev.* 1958, **26**, No. 4, 161–4, illus. [Edinb. E. Scot. Coll. Agric.]

Practical measures to avoid strangles in sugar-beet roots are : to delay singling, if possible until the plants have about 4 leaves ; to grow the crop on the flat so that exposure after singling is lessened.—E.B.O.

206 Norris, H. H. **Irrigation for beet in the eastern counties** [**of England**]. *Brit. Sug. Beet Rev.* 1958, **26**, No. 4, 169–70. [Ely Sug. Fact. Cambs.]

207 Thompson, E. G. **Trials of commercial strains of sugar beet.** *Brit. Sug. Beet Rev.* 1958, **26**, No. 4, 157–9. [Nat. Inst. Agric. Bot., Cambridge]

The results from the trials described showed that the behaviour of strains in 1957 was similar to that in previous years [see *Fld Crop Abstr.* 11 : 213].—E.B.O.

208 Wauthy, R. and others. Les résultats des essais comparatifs de variétés de betterave sucrière en Belgique de 1953 à 1957. [**The results from comparative trials of sugar-beet varieties in Belgium in 1953-7.**] *Publ. tech. Inst. belge Amélior. Better.* 1957, **25**, No. 4, 303–20, illus., English and Flemish summaries.

Tables show yields of roots, sugar and tops, and bolting data for 37 sugar-beet varieties tested in 1957 in 3 comparative field trials in different localities. The varieties were placed in similar order, and the difference in sugar yield was about 27% between the best and the worst varieties. Other tables show similar data for trials in previous years. The varieties tested were sampled each year in commercial lots. To check the results of the 3 comparative trials of 1957, 5 of the varieties tested in those trials, viz. Zwaanesse III-E, Kühn P-N, Maribo P polyploid, Hilleshög R polyploid E and Schreibers S.K.W. III, were grown in each locality in a separate trial in which their identity was not disclosed. It was found that the differences between the root yield, sugar percentage, yields of sugar and tops of these 5 varieties in the comparative trials and of their blank duplicates were less than the least significant differences in 111 cases out of 120. This result shows the value of the trials.—E.B.O.

209 Rietberg, H. Rassenkeuze bij suikerbieten. [**Choosing sugar-beet varieties.**] *De Suikerbiet* 1957, **11**, No. 5, 29–44.

Descriptions are given of the main characteristics of the early and late varieties of sugar-beet suitable for growing in the Netherlands. The average yield of tops and roots and the average sugar content of 10 varieties of sugar-beet grown in experimental plots in the N. and S. regions of the Netherlands are compared.—R.B.

210 Stracke, W. Zuckerrübensamenbau nach einem neuen Verfahren. [**A new procedure for sugar-beet seed production.**] *Dtsch. Landw.* 1958, **9**, No. 4, 167–72, bibl. 11, illus. [Inst. Acker-u. PflBau, Univ. Jena, E. Germany]

The technique known as " winter-beet seed production", earlier reports of which were given in *Fld Crop Abstr.* 9 : 1239 and 10 : 599, has been tested on a field scale. The barley varieties most suited to serve as cover crops are the late-ripening Freya or Elsa. Seed of sugar-beet and barley are drilled in alternate rows in a N.S. direction as early as possible, say mid-March to early April. The sowing rate is 14–15 kg. beet and 130–140 kg. barley per hectare. Using this method and following directions for cultivation (which include deep autumn ploughing, supplying fertilizer adequate for the 2 crops, cutting the barley high to leave a tall stubble, and covering the stecklings to protect them from frost during the winter), only half the labour is required to produce seed of a quality equal to that obtained by storing the stecklings in clamps during the winter.—D.B.

211 Ripper, W. E. **Chemical control of broad-leaved weeds in beet.** *Brit. Sug. Beet Rev.* 1958, **26**, No. 4, 171–6, bibl. 10, illus.

The results from laboratory- and field-investigations demonstrated that in the chemical control of broad-leaved weeds, especially with propham (IPC), the absorbent-barrier method prevents phytotoxic damage to young beet plants. This method consists of placing a barrier of active carbon below the soil layer in which most of the annual weeds germinate, and above the crop seeds. An application of 7–8 lb. of propham per ac. as an all-over spray on beet sown on light sandy loam under an absorbent barrier of 30 lb. per ac. is considered practical.—E.B.O.

212 Lüdecke, H. and Winner, C. Selektive

Unkrautbekämpfung in Zuckerrüben mit Natriumnitrat im "post-emergence" Verfahren. **[Selective weed control in sugar-beet fields by the post-emergence method, using sodium nitrate.]** *Z. Acker- u. PflBau* 1958, **106**, No. 1, 26–48, bibl. 31, illus., English summary. [Inst. Zuckerrübenforsch., Göttingen, W. Germany]

In a 3-yr. field trial, $NaNO_3$ applied as a post-emergence spray in a 30–35% solution at the rate of 310 kg./ha., killed most of the dicotyledonous weeds and left the beet unharmed. There was a saving of 10–30% in the labour required for subsequent cultivation. The best results were obtained when the weeds were in an early growth stage (less than 8–10 cm. high) at a time when there was a continuous wind and direct sunlight. The weeds encountered fell into 3 groups : those killed by, partially injured by, and resistant to, $NaNO_3$. The herbicide was particularly effective against those weeds which give trouble at singling. Its selective action was studied in laboratory experiments and was related to differences in the osmotic value of the cell sap in the epidermal cells of the leaf in different species. The risk of inhibiting the growth of the sugar-beet crop is lower than when herbicides are used in pre-emergence treatment. The financial risk is small because, should the herbicidal action be unsuccessful owing to unsuitable weather or the presence of particularly resistant species e.g. dock, $NaNO_3$ acts as a fertilizer.—D.B.

213 GELMETTI, A. Efficacia anticercosporica di alcuni anticrittogamici acuprici. **[Effectiveness of some non-copper fungicides against *Cercospora beticola*.]** *Ann. Fac. Agr., S. Cuore* 1958, **65**, No. 1, 13–17, bibl. 6, English and French summaries.

In a field trial in Piacenza province, Italy, to control *Cercospora beticola* on sugar-beet, Bordeaux mixture was the most effective preparation tested, as it gave the lowest percentages of affected plants and of affected leaves per plant, and the lowest number of spots per leaf ; it was followed by thiram B, ziram plus Cu, and thiram A.—E.B.O.

214 LEAR, B. and RASKI, D. J. **Control by soil fumigation of root-knot nematodes affecting sugar beet production in California.** *Pl. Dis. Reptr* 1958, **42**, No. 7, 861–4, illus. [Dep. Pl. Nematology, Univ. California, Davis]

Area applications (made by chisel, 8 in. deep in rows 12 in. apart) of DD, telone and nemagon gave higher beet yields and better control of *Meloidogyne incognita acrita*, than did row applications, but the dosages used in area applications were higher. The minimum effective dose of DD for row applications was 8 gal./ac. Treated plots had a higher sucrose % than the controls. In a second trial DD and telone gave good nematode control, but nemagon at 1 gal./ac. was less satisfactory.—A.M.H.

215 DE SUIKERBIET. Vergelingsziekte bij bieten. **[Sugar-beet yellows.]** *De Suikerbiet* 1958, **11**, No. 9, 69–71.

The principal reservoirs of sugar-beet yellows are (a) fodder-beet clamps in which aphids are allowed to overwinter ; (b) peach aphids [*Myzus persicae*], which overwinter in the egg stage on *Prunus persica* and *P. padus*, and (c) bean aphids [*Aphis fabae*], overwintering on *Euonymus europaeus* and *Viburnum opulus*. Aphids prefer to attack open rather than dense stands of beet. To destroy aphids overwintering on fodder-beet, clamps should be disposed of before the beginning of April ; if remaining clamps are opened at this time and beet tops are cut off and used first for fodder, it is safe to store the roots until mid-April. Any fodder-beet remaining should be burned or buried. Aphids appearing in beet fields are best eradicated with systemic insecticides, such as demeton.—R.B.

216 BJÖRLING, K. **Incidence of beet yellows virus in weeds in Sweden and some notes on differential hosts for strains of the virus.** *Ann. Acad. Reg. Scient. Upsal.* 1958, No. 2, 17–32, bibl. 13, illus.

217 ŠANDERA, K. and DRACHOVSKÁ, M. Laboratorné rozlišeni "jarovizovaného" a normálního cukrovkového "semene." **Laboratory differentiation of "vernalized" and normal sugar-beet seed.** [Czech] *Ann. čsl. Acad. agric. Sci., Pl. Prod. Ser.* 1958, **4**, (**31**), No. 5, 571–6, bibl. 3, Russian, English and German summaries.

The procedure involves a conductometric analysis of diffusion. F. Eng. s.—M.H.

218 MARGARA, J. Sur la devernalisation de bourgeons de la tige chez des espèces du genre *Beta*. **[On the devernalization of stem buds in species of the genus *Beta*.]** *C.R. Acad. Sci., Paris* 1958, **246**, No. 1, 145–7, bibl. 5. [Inst. Nat. Rech. Agron., Versailles]

In this study, carried out mainly with the sugar-beet variety Kleinwanzleben E, the experimental plants, which had already formed flower stems, were placed under a photoperiod of 8 hr. After 15–60 days they showed signs of devernalization, characterized by a shortening of the internodes, formation of rosettes, and frequent abortion of the flower primordia. After 60 days under short-day conditions the plants were placed under continuous light in a glasshouse, where most of them continued to develop vegetatively.—E.B.O.

219 OWEN, P. C. **The growth of sugar beet under different water regimes.** *J. agric. Sci.* 1958, **51**, No. 2, 133–6, bibl. 3. [Rothamsted Exp. Sta., Harpenden, Herts.]

[See also *Fld Crop Abstr.* 11 : 1616.] Sugar-

beet (Kleinwanzleben E) was grown in plots 10 ft. square, protected from rain by Dutch lights. The plots were sown on 17 Apr., 1957, and given uniform watering, equivalent to approx. 1 in. of rain, up to 3 June, during which time the mean soil-water content of all plots was 26–30%. From 3 June to 20 Aug. watering treatments were : (a) minimum water stress maintained, with a total of 5·4 in. water applied ; (b) 1 in. of water applied on 10 July, when the soil-water content had reached 13% ; (c) 2 applications of 0·125 in. and 3 of 0·25 in. of water between 26 June and 14 Aug. Fresh- and dry-weight yields, leaf areas and net assimilation rates at each of 6 sampling dates are tabulated. On 20 Aug., dry-weight yields from treatment (a) were equivalent to 60 cwt. roots and 53 cwt. tops per ac. Yields from (b) and (c) were about 20% less. The total dry weights per ac., on 20 Aug., per in. of water applied were : (a) 23 cwt.; (b) 93 cwt. ; (c) 100 cwt. Yield differences were apparently due to differences in leaf area rather than in net assimilation rate.—A.M.H.

220 Schaeffler, H. and Stritesky, A. Zeitdüngungsversuche mit Kalkstickstoff zu Zuckerrüben. [**Experiments on the time of fertilizing sugar-beet with calcium cyanamide.**] *Prakt. Bl. PflBau* 1958, **53**, No. 1, 16–30, bibl. 8, illus.

In pot experiments with sugar-beet on 50/50 compost/soil mixture of pH 7·4, $CaCN_2$ applied 15 days before sowing had a negligible effect on germination, but applications closer to sowing time increasingly delayed germination. The fertilizer had a substantial weedkilling effect. $CaCN_2$ is best applied 10–15 days after preparing the field and sowing should follow 10 days later. [From *Soils and Fert.* 21 : 1972.]—D.B.

FODDER-BEET

See also Abs. 352, 365

221 Dunne, J. P. and O'Sullivan, T. J. R. **Fodder beet variety trials 1951-1954.** *J. Dep. Agric. Republ. Ire.* 1956–7, **53**, 151–70, bibl. 12.

The classification of fodder-beet varieties is discussed. The % dry matter in roots and tops, yields of roots, tops and root, top and total dry matter, ease of harvesting, and soil tare as % of gross root weight are tabulated for 27 varieties. Of the high dry-matter fodder-beet varieties, Hinderupgaard X and Hunsballe X are recommended. Pajbjerg Rex X was the best of the medium dry-matter fodder-beet varieties. In the high dry-matter mangel group, Barres Øtofte X had the highest root dry-matter content and Barres Øtofte Nova X had the best dry-matter content of tops. Barres Øtofte Nova X also gave a high yield of tops, was the easiest to harvest and had the lowest soil tare. Barres Strynø X was the best of the low dry-matter mangel group.—A.M.H.

222† Kutuzov, G. P. [**The use of pentachlorophenol (Na) for combatting the principal spring weeds in fodder-beet sowings.**] [Russian] *Doklady Vsesojuz. Akad. S-H Nauk (Proc. Lenin Acad. Agric. Sci.)* 1958, **23**, No. 8, 34–7. [All-Union Sci. Res. Inst. Fodders, Moscow]

It is recommended that pentachlorophenol (Na) at 10 kg./ha. be applied (during the 4th day after sowing the beet) in water (500 l./ha.) to the soil surface. The toxicity of the substance depends on soil type, being much lower on peat soils than on sandy ones. An increase in soil moisture, from 40 to 80% of full moisture-holding capacity, increases the toxic effect twofold. The chemical does not adversely affect the soil microflora.—M.H.

223† Ernould, L. Traitement de betteraves fourragères en silos, au "Conserbeta". [**Treatment of fodder-beet in clamps with conserbeta.**] *Publ. tech. Inst. belge Amélior. Better.* 1958, **26**, No. 1, 3–14, illus., English and Flemish summaries.

In trials in Belgium in 1954–5, fodder-beet was dusted, at the time of clamping, with conserbeta at the rate of 3–4 kg. per ton of beet. In spring in the treated clamps, it was found that : (a) the beet had very short sprouts and no rootlets ; (b) temperature was lower than in the untreated clamps; (c) rot caused by *Botrytis* sp. and *Fusarium* sp. was slightly reduced ; (d) there were no aphids. It is hoped that this treatment would reduce the incidence of sugar-beet yellows in the field. [See also *Fld Crop Abstr.* 11 : 1607.] The cost of dusting is, however, high in relation to the economic value of fodder-beet.—E.B.O.

224 Bakermans, W. A. P. and Mooi, J. C. Bewaarproeven met voederbieten met en zonder Conserbeta 1955/56. [**Storage tests on fodder-beet with and without conserbeta, 1955-6.**] *Versl. Inst. Biol. Scheik. Onderz. LandbGew.* 1957, No. 3, 1–12, bibl. 4.

Experiments on the storage of fodder-beet were carried out during 1955–6 to test the effectiveness of conserbeta at 0·3 kg./100 kg. of beet in controlling violet root-rot [*Helicobasidium purpureum*]. Treatment completely controlled the spread of root-rot, lessening the damage by 2·5 kg./100 kg. beet. Losses caused by respiration were reduced by 4·6 kg./100 kg. Sprouting and root formation in the stored beet were greatly reduced by treatment, and no aphids were found in any of the treated clamps. The temperature in treated clamps was 0·4°C. lower than in untreated clamps ; 9% of beet in treated clamps was damaged by frost compared with 7·7% in untreated clamps. F. s.—R.B.

TURNIPS

225 Nissen, Ø. and Skaland, N. Silonepe. Dyrkings-, ensilerings- og fordøyelsesforsøk. **Silage turnips. Field, ensiling and digestion experiments.** *Forskn. Fors. Landbr.* 1958, **9**, No. 3, 245–70, bibl. 14, English summary.

In trials at 2 locations in Norway in 1952 to compare different sowing rates for silage turnips, dry-matter yields were very variable, but showed that row drilling was preferable to broadcasting, mainly because of differences in labour requirement. In trials at a number of locations, 14 varieties were compared. In 45 trials, Roskilde VII winter turnip gave average yields of over 800 kg. dry matter/decare, of which 40–60% was leaf dry-matter. Roskilde B. spring turnip gave slightly higher average yields than Roskilde VII, of which 30–50% was leaf dry-matter. The Forus strain Kvit Mai also outyielded Roskilde VII slightly, but had low leaf-yields. Greystone Amagergaard V and Greystone Roskilde were outyielded by Roskilde VII, but had very high leaf-yields. In 26 sowing-rate trials in 1953–5, rates of 150, 300 and 450 g./decare were used. Dry-matter yields were 792, 831 and 841 kg./decare, respectively. A rate of 450 g. resulted in high earth-tare and high labour requirement ; a rate of 300 g./decare was recommended in practice, with a spacing of 50/60 cm. between rows. In harvest-date trials, delaying harvest from 85 days after sowing to *c.* 115 days increased yields by 6·9 kg. dry matter/decare per day.—P.J.B.

POTATOES

See also Abs. 394, 395, 492, 494, 515

226 Cox, A. E. **The potato. Its production and consumption.** *World Crops* 1958, **10**, No. 9, 333–6, bibl. 6, illus.

Production and consumption of potatoes in different countries, the temperature, water, day-length, soil and cultivation requirements of the crop, varieties and certification, pests and diseases are discussed.—A.M.H.

227 Department of Agriculture, Cyprus. **Potato growing in Cyprus.** *Bull. Bl Dep. Agric. Cyprus* 1956, pp. 14. [Received Sept., 1958]

228 Heidrick, L. and others. Recomendaciones generales sobre el cultivo de papa en la Sabana de Bogotá, de acuerdo con las observaciones hechas en Tibaitatá. [**General recommendations for growing potatoes in the Savanna of Bogotá (Colombia), according to observations made in Tibaitatá.**] *Agric. trop., Bogotá* 1958, **14**, No. 5, 297–306, illus.

Recommendations are made regarding : varieties ; sowing date ; sowing rate ; size of seed potatoes ; manuring ; control of diseases, pests and weeds ; and harvesting.—E.B.O.

229 Agadžanjan, G. H. and Ter-Saakjan, T. S. [**Some biological peculiarities in the potato varieties Kalitinec and Lorh when grown with different nutritional areas under conditions of the Leninakan tableland.**] [Armenian] *Izv. Akad. Nauk Armjansk SSR (Bull. Acad. Sci. Armenian SSR)* 1958, **11**, No. 4, 65–74, Russian summary.

The nutritional areas in these tests were (in cm.) ; 60 × 30, 70 × 20, 70 × 30, and 70 × 40. In all variants of the test, Lorh produced larger tubers and gave higher yields than Kalitinec. Both varieties gave their greatest yields with the 60 × 30 cm. nutritional area. F. Russ. s.—M.H.

230 Laumont, P. and others. Note sur le choix des variétés de pommes de terre adaptées aux diverses régions et saisons de culture en Algérie. [**Note on the choice of potato varieties adapted to different regions and growing seasons in Algeria.**] *Ann. Inst. agric. Algér.* 1956, **10**, No. 3, 1–42, illus. [Sta. Cent. Maison Carrée, Algiers] [Received June, 1958]

An account is given of results from investigations on potatoes carried out in Algeria in 1942–54. Two crops of potatoes can be grown per annum : in winter (Oct.-Apr.), with or without irrigation, mainly for export ; and in spring-summer (May-Dec.) under irrigation, mainly for local consumption. The main aspects considered are : different growing seasons and growing regions ; seed potatoes (imported and local) ; physiological and phenological influences on varieties ; varietal trials. The recommended varieties are listed.—E.B.O.

231 Jessup, J. R. **Potato sett spacing trial.** *Agric. Gaz. N.S.W.* 1958, **69**, No. 6, 304–6.

In trials carried out in the Guyra district over 3 seasons, using the varieties Adina, Walanga and Awaba, close planting (8- to 9-in. in the row, in rows 36 in. apart) decreased the amount of hollow heart and growth cracking and the proportion of tubers weighing over 8 oz. It also increased the yield and uniformity compared with those from wider in-the-row spacings.—A.M.H.

232 Choudhuri, H. C. and Choudhuri, S. R. **Fertilizer trials with different sizes of seed potatoes and different planting distances.** *Amer. Potato J.* 1958, **35**, No. 6, 526–33, bibl. 4, 1 map. [State Exp. Sta., Burdawn, W. Bengal, India]

The trial included 81 treatments, with 1 replicate of each. An 80 : 160 : 80 NPK mixture gave significantly higher yields than a 60 : 120 : 60 mixture, which was, in turn, better than a 40 : 80 : 40 mixture. Seed tubers of 1·5-in. diam. gave significantly higher yields than those of 1·0- or 0·75-in. diam. Spacing at 24 × 5 in. gave the highest yield, but produced a high % of under-

ized tubers. A spacing of 30 × 8 in. with 1·5-in. diam. seed-tubers gave the highest percentage of ware tubers. The fertilizer treatments did not differ in their effect on tuber size.—A.M.H.

233 Steineck, O. Die Bewässerung der Kartoffel. [**Irrigation of the potato.**] *Dtsch. Landw. Pr.* 1958, **81**, No. 19, 185–6, illus. [Hochsch. f. Bodenkultur, Vienna]

Several years' experiments at the Gross-Enzerdorf Experiment Station show that the potato is particularly sensitive to faulty irrigation technique. The planning of irrigation must take into account 3 phases of the plant's development which govern yield. The first phase, that of stolon formation, begins in normal years about 3 weeks after emergence and when the shoots have 8–10 leaves, i.e. long before flowering. This is a critical period when it is essential that water supplies should be adequate. The second phase, that of tuber setting, begins in normal weather some 4–5 weeks after emergence. Adequate water supplies during this phase enable every stolon to set tubers. The third phase, that of tuber growth, is of longer duration than the other two. It lasts from the beginning of tuber formation to maturity and is decisive for single-tuber weight. Periods of interrupted growth through drought results in unequally-sized and malformed tubers. Irrigation must therefore ensure a regular supply of water from the beginning of stolon formation to maturity. This requires the continuous determination of soil moisture in order to prevent it falling below a certain level, e.g. in medium soils, 40–60% of the water capacity, and water is then applied *before* there is any lack of moisture rather than after symptoms of drought have appeared. The ill effects of irregular applications of water after drought are enumerated. The generally accepted view that the best time for watering potatoes is when the plants are in flower is, for the foregoing reasons, not always tenable.—G.M.R.

234 Jones, S. T. and Johnson, W. A. **Effect of irrigation at different minimum levels of soil moisture and of imposed droughts on yield of onions and potatoes.** *Proc. Amer. Soc. Hort. Sci.* 1958, **71**, 440–5, bibl. 8. [Alabama Polytech. Inst., Auburn]

Irrigating at 0·3 atmospheres tension gave higher yields of Sebago potatoes than irrigating at higher soil-moisture tensions. Irrigating at 0·3 atmospheres tension for the first 6 weeks of the 9-wk. growing period and at 1·2 atmospheres after that, gave lower yields than continuous irrigation at 0·3 atmospheres. Drought periods of 2, 4 or 6 weeks reduced yields by 19, 45 and 66%, respectively. Droughts occurring early in the season were less detrimental than those occurring later.—A.M.H.

235 Schippers, P. A. De invloed van de bodemvochtigheid op de nachtvorstaantasting van pootaardappelen in Drente. [**The effect of soil moisture upon night-frost attack of seed potatoes in Drenthe.**] *Landb Voorl.* 1958, **15**, No. 5, 230–6.

Night frost occurring on 23–24 June 1957 affected all but 30% of 200 potato-trial plots on sandy soil in the Province of Drenthe. On 20% of the plots the leaves were seriously injured, on 35% moderately so and on 15% only slightly. On dry soils the injury was not only more common but also more severe than on moist soils. The time of ploughing appeared to have no influence upon the occurrence or degree of injury. The presence of adequate moisture was an important factor in the recovery of the plants. The average yield loss incurred from severe night frost was approximately 35% on the dry soils, 25% on moisture-containing soils and 20% on moist-to-wet soils. The shortness of the period between the occurrence of the frost and the harvesting of the potatoes limited the recovery of the plants so far as yield was concerned. Where the frost was not severe the difference in yield as between soils of different moisture content was only slight, or about 10%. The moisture content of the ground had less effect upon yield than the degree of night frost. Plots on dry and moisture-containing soils gave, respectively, 15 and 5% less yield than plots on moist and wet soils when there was no night frost, or practically none. The variation in the under-water weight of tubers from comparable plots was so great that no conclusion could be reached as to how far this character was affected by night frost and soil moisture.—G.M.R.

236† Oberembt, E. Winterzwischenfrüchte als Vorfrüchte zu Silomais. [**Winter catch-crops as preceding crops for silage maize.**] *Dtsch. Landw.* 1958, **9**, No. 9, 439–41. [Inst. Landw. Versuchs- u. Untersuchungswesen, Halle-Lauchstädt, E. Germany]

In a 3-yr. experiment in Bad Lauchstädt the effect of various winter catch-crops (winter rape, fodder rye, Petkuser rye with pea or vetch, Landsberg mixture, and vetch with crimson clover) on the yields of potatoes and silage maize grown as second crop was investigated. The highest yields of potato tubers and of silage maize were obtained after winter rape, the lowest after Landsberg mixture. Yields of silage maize suffered less than potato yields from late sowing resulting from late harvesting of the catch crop. Legumes in the preceding crop had a modifying influence on the yield reduction resulting from late planting or sowing. Sowing of early maize before 20 May is recommended ; this enables it to ripen within the frost-free period.—D.B.

237 Lunden, A. P. and Roer, L. Sammenlignende forsøk med tidlige potetsorter i

årene 1941–1954. **Variety trials with early potato varieties in south-eastern Norway in the years 1941-54.** *Forskn. Fors. Landbr.* 1958, **9**, No. 3, 173–200, bibl. 5, English summary.

The results are given of 47 trials at locations in south-eastern Norway, 14 of which were carried out at Vollebekk. Harvest dates at Vollebekk were approximately 15 and 26 July and 5 and 22 August. At the other locations, 3 harvest dates, with about 10-day intervals, were used. Early Puritan was used as a standard. In the Vollebekk trials, yields of tubers greater than 30 mm. in size at the 1st harvest date were greatest for Doon Early, with 1342 kg./decare, followed by Irish Cobbler, 1249 kg., Arran Pilot, 1244 kg. and Early Puritan, 1220 kg. At the 2nd harvest date, yields were highest for Doon Early, with 1918 kg., followed by Eva (4 trial years only) with 1871 kg. and King George V, 1856 kg. At the 3rd harvest, yields were highest for Eva with 2368 kg., followed by King George V, 2364 kg. and Doon Early with 2271 kg. At the 4th harvest, yields were highest for King George V with 2673 kg., followed by Eva with 2329 kg., Doon Early 2314 kg. and Immun Keiserkrone, 2272 kg. In the remaining regional trials, average yields of saleable tubers at the 1st harvest date were highest for Eva with 1777 kg./decare, followed by Arran Pilot, 1787 kg. and Early Puritan, 1557 kg. At the 2nd harvest date, Eva again gave the highest yields with 2297 kg. followed by Arran Pilot, 2250 kg. and Doon Early, 2135 kg. At the 3rd harvest, Eva and Arran Pilot both had yields of 2562 kg., followed by King George V with 2540 kg. Descriptions are given of the following varieties : Doon Early, Irish Cobbler, Arran Pilot, Early Puritan, Epicure, King George V, Frühmölle, Frühbote, Dukker grønne groer, Saga, Immun Keiserkone, Eva, Primula, Dunvegan, Duke of York, Vanguard and Tammisto Early, with observations on their performance in Norway. —P.J.B.

238 Rigot, N. Une variété belge de pomme de terre : Electre. [**A Belgian potato variety : Electre.**] *Rev. Agric., Brux.* 1958, **11**, No. 3, 333–45. [Sta. Rech. Amélior. Pomme de Terre, Libramont, Belgium]

Information, including a description, is given on Electre, which is high yielding, virus-disease resistant and stores well. In comparative trials in 1952–6, it yielded 331–371 kg. of tubers per are [100 sq.m.]—about the same as Voran and more than Eigenheimer and Bintje.—E.B.O.

239 Escribano, I. F. Ensayos sobre variedades de patata realizados durante el periodo 1949–1956. [**Varietal trials with potatoes during 1949–56.**] *An. Inst. nac. Invest. agron.* 1958, **7**, No. 2, 333–530, English summary. [Esta. Mejora Patata, Vitoria, Spain]

In yield trials at Vitoria the best varieties were : A-41, Santa Lucía, Katahdin, Erntedank and Palogán, (early) ; Olalla, Alzania, Solanum, Heida and Gauna Blanca, (medium-cycle) ; Sabina, Agnes, Alava, Sergen, Immertreu and Goya, (late). In trials to study the rhythm of tuber formation, the earliest varieties to form tubers were placed in the following order : Palogán, Bintje, Erntedank, Craigs Royal, A-41, Santa Lucía, Alegría Oro, Olalla, Krasawa and Alava. In another series of trials, varieties were tested in different regions of Spain. Although general conclusions from these trials cannot be given, Así and Arran Banner (early), Olalla and Heida (medium-cycle), Sabina, Alava and Sergen (late) yielded best in most cases. Arran Banner was outstanding in many dry regions of Spain but not at Vitoria, which is situated in a humid region. A-41, the best early variety at Vitoria, was not included in many trials in the other regions.—E.B.O.

240 Akeley, R. V. **Evaluation of potato varieties.** *Amer. Potato J.* 1958, **35**, No. 6, 517–25, bibl. 1. [Crops Res. Div., Agric. Res. Serv., U.S. Dep. Agric., Beltsville, Maryland]

The relative importance of various potato varieties, as indicated by the amounts of seed certified in the USA in 1956, and the characteristics of the varieties are discussed.—A.M.H.

241 Cadiz, T. G. and Acosta, J. C. **A study of Irish potato varieties in San Mateo, Rizal.** *Philipp. Agriculturist*, 1958, **42**, Nos. 2 and 3, 70–2. [Cent. Exp. Sta., College, Laguna, Philippines]

Yield trials were conducted with the potato varieties Baguio, Alpha A, Alpha B, Japan No. 5 and Japan No. 6 in replicated two-rowed plots, the rows being 30 cm. apart and 5 m. long. Japan No. 5 (5·61 kg.) and Japan No. 6 (3·97 kg.) gave the highest yields. Baguio (2·45 kg.) gave the lowest yield, but had the best eating quality.—R.B.

242 Schwarz, W. Bericht über die Versuchsergebnisse zur Kartoffelpflanzguthandlung aus den Jahren 1954, 1955 und 1956. [**Reports on results of experiments on seed-potato treatment in 1954-6.**] *Z. landw. Vers. UntersuchW.* 1957, **3**, No. 1, 66–75, bibl. 8, Russian and English summaries. [Inst. Landw. Versuchs- u. Untersuchungswesen, Rostock, E. Germany]

The statistically analysed results of 51 trials carried out during 3 years by the 5 institutes of the Acadamy of Agriculture of Eastern Germany showed that the yield increase obtained by presprouting of tubers was twice that obtained by breaking dormancy. This applied to early, medium and late potatoes.—D.B.

243 Stottmeister, W. Die Beziehungen zwischen Knollenertrag und Bodenart des

Herkunftsortes. [**The connexion between tuber yield and the type of soil on which the seed potatoes were produced.**] *Dtsch. Landw.* 1958, **9**, No. 8, 374–6, bibl. 6. [Inst. PflZücht., Gross-Lüsewitz, E. Germany]

Seed potatoes produced on loess soil gave the highest tuber yield in subsequent cultivation in Gross-Lüsewitz (a humic loamy sand) ; those produced on sandy soils gave the lowest yield. Sandy loam and loamy sand were intermediate in value for producing seed potatoes. These results applied to all varieties tested, whether early, medium-early, medium-late or late.—D.B.

244 LANGWERDEN, E. J. Rentabiliteit van de poterteelt voor eigen gebruik. [**Profitability of growing one's own seed potatoes.**] *Landb-Voorl.* 1958, **15**, No. 4, 160–1. [Doetinchem, Netherlands]

The costs incurred in growing and storing seed potatoes are compared with the cost of purchase, a profit of 214 florins per ha. resulting when the seed is home-grown. Other advantages mentioned are the ready availability of the seed potatoes and the possibility of using the same plot for a catch crop such as turnips. The technique of growing seed potatoes is briefly outlined.—G.M.R.

245 JÖNSSON, E. Några aktuella problem inom utsädeskontrollen av potatis i Nederländerna ock Storbritannien med anknytning till svenska förhållenden. **Some actual problems from the control of seed potatoes in the Netherlands and Great Britain compared with Swedish conditions.** *Medd. Frökontrollanst., Stockh.* 1958, No. 33, 72–88, bibl. 13, English summary.

Current classification schemes for seed potatoes in Sweden, Great Britain and the Netherlands are reviewed briefly and the major disease problems relating to seed-potato control in these countries, including virus diseases, off-type plants, black leg caused by *Erwinia* spp., potato eelworm and ring rot (*Corynebacterium sepedonicum*), are reviewed.—P.J.B.

246 MEGGITT, W. F. and others. **An evaluation of spray and granular applications of herbicides for weed control in potatoes after the final cultivation.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 66–70.

In trials during 1956 and '57 in New Jersey, granular formulations of dinoseb, EPTC, simazin, CDAA, CDT (2-chloro-4-bis (diethylamino)-s-triazine) and dinoseb+CDEC and spray treatments of neburon, CDT, EPTC, simazin and monuron were applied after the last cultivation, but before weed emergence. Dalapon and dalapon +2,4-D were also applied after weed emergence. In 1956, but not 1957, only CDT gave good weed control, with no reduction in tuber yields. Granular EPTC (1957, only) was very effective for giving prolonged weed control, with no yield reduction.—P.J.B.

247 SAWYER, R. L. and others. **Progress report on tolerance of potatoes to herbicides applied at last cultivation.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 71–3.

The following materials all showed promise as herbicides for use after the last cultivation : natrin, alanap, 3Y9, CDEA, CDEC, diuron and dalapon. Natrin showed considerable sprout-inhibiting effect during storage. Data are given of the effect of these materials on tuber quality.—P.J.B.

248 CUNNINGHAM, C. E. and TREVETT, M. F. **Weed control in Maine potato fields.** *Down to Earth* 1958, **13**, No. 4, 7.

In Maine, spraying, just prior to the emergence of potatoes with a mixture containing formulations of dinoseb and dalapon controlled both broad-leaved and grass weeds.—M.H.F.

249 TREVETT, M. F. and others. **The effect of several herbicides on potato yields, 1954-1957.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, pp. 390–7. [Maine Agric. Exp. Sta., Orono]

Of a number of emergence and pre-emergence herbicidal treatments applied to potatoes in field trials in Maine, the following had no significant effect on tuber yield : EPTC at 2, 4 or 8 lb. a.e./ac., dinoseb at 0·75, 3, 4·5 or 6 lb., simazin at 1 lb., CDAA and CDEC at 4 or 8 lb., diuron at 0·6 or 1·2 lb., dalapon at 1·6 lb., Na 2,3-dichloro isobutyrate at 5 or 10 lb., monuron at 0·5 or 1 lb., neburon at 0·5 or 1·5 lb. and NPA at 4 or 6 lb./ac. Rates of 2 or 4 lb. simazin and 1·5 lb. 2,3,6-TBA reduced tuber yields significantly. Applications of 6 lb. dalapon significantly reduced the yield of plants grown from cut setts derived from treated crops ; the effect on the yield potential of whole seed was relatively less detrimental. Post-emergence treatment with dalapon at 3–6 lb./ac. resulted in the inhibition of apical sprouting in tubers taken from treated plants ; this effect was greatest where the highest rates of dalapon were applied.—P.J.B.

250 FISCHNICH, O. and others. Wachstumsregulatoren im Kartoffelbau. [**The use of growth-regulating substances on potato crops.**] *Eur. Potato J.* 1958, **1**, No. 1, 25–30, bibl. 22, illus., German, French and English summaries. [Inst. PflBau und Saatguterzeugung and Inst. Tierernährung, Braunschweig-Völkenrode, Germany]

Late weeds in potato crops, especially *Galinsoga parviflora*, may be destroyed by spraying with growth-regulating substances when the haulms are becoming yellow. Three different salts of MH and 2,4-D Na salt at concentrations of 0·001–1% and commercial preparations of 2,4-D, 2,4,5-T and MCPA, at rates used for weed control in crops,

were applied. Treatment facilitated mechanical harvesting and reduced the number of tubers left in the soil. Spraying with growth-regulating substances at this late stage had no harmful effect on seed or ware crops, but treatment with MH prolonged tuber dormancy. F. Eng. s.—A.M.H.

251 Morris, H. E. and Afanasiev, M. M. **Potato diseases in Montana and their control.** *Circ. 215 Montana Agric. Exp. Sta.* 1956, pp. 37, illus.

252 Bartz, J. F. and Berger, K. C. **Urea formaldehyde concentrate-85, a promising control for potato scab.** *J. agric. fd Chem.* 1958, **6**, No. 9, 675–7, bibl. 5. [Dep. Soils, Univ. Wisconsin, Madison]

Land infected with *Streptomyces scabies* was treated with 50, 150 and 250 gal. of urea formaldehyde concentrate (UF-85)/ac. (containing 1 lb. N/gal.) or with 50 (in 1956) or 100 (in 1957) lb. 20% PCNB, (terraclor 20% dust) in combination with various rates of NH_4NO_3. Potatoes were planted immediately afterwards. UF-85 at 250 gal./ac. reduced stands by 42% ; other treatments did not affect stands ; increases in yield occurred at all levels of application. The scab index (0–100) was reduced by UF-85 applied at 150 gal./ac. from 14·5 to 0·8 in 1956 and from 22 to 1·5 in 1957. PCNB reduced the scab index to 1·0 in 1956 and to 12·8 in 1957. UF-85 was a good source of N, did not leach so rapidly as NH_4NO_3, and had no effect on the sp. gr. of the tubers.—R.B.

253 Emden, J. H. van. **Control of *Rhizoctonia solani* Kühn in potatoes by disinfection of seed tubers and by chemical treatment of the soil.** *Eur. Potato J.* 1958, **1**, No. 1, 52–64, bibl. 8, English, French and German summaries. [Inst. Plantenziektenkundig Onderzoek, Wageningen, Netherlands]

Disinfection of seed tubers with an organomercury compound was very effective for reducing the incidence of *Rhizoctonia* sclerotia in the crop, even where the seed tubers were apparently clean. Seed disinfection tended to reduce the yield of tubers in the larger size group (>45 mm.). In 1955, soil treatment with zineb at 13 and 27 kg./ha. had no effect on the incidence of sclerotia. PCNB at 200 kg./ha. greatly increased the % clean tubers, but slightly decreased yields. In 1956, soil treatment with PCNB at 100 and 200 kg./ha. improved crop appearance, but significantly reduced yields. Application of PCNB in January was not effective. —A.M.H.

254 Callbeck, L. C. **The effect of zinc as a constituent of potato fungicides.** *Amer. Potato J.* 1958, **35**, No. 8, 626–32, bibl. 7. [Sci. Serv. Lab., Charlottetown, Prince Edward Island, Canada]

The results are reviewed of 4 additional years' studies of the effect on tuber yields and control of late blight [*Phytophthora infestans*] in potatoes of : (a) including a Zn salt in the regular spray mixture, (b) treating seed pieces with solutions of Zn salts, and (c) incorporating Zn compounds in the soil [see *Fld Crop Abstr.* 8 : 550]. $ZnSO_4$ used alone had some fungicidal value and it also increased the fungicidal efficiency of tribasic copper sulphate, copper oxychloride sulphate, Bordeaux mixture and nabam. In the earlier years of the experiment, the effect of Zn in increasing yields was attributed to its fungicidal action, which produced variations in the amount of defoliation. In 1956 and '57, when the defoliation factor was eliminated, $ZnSO_4$ still increased yields. Over 6 yr., drill applications of $ZnSO_4$ and Zn acetate at 28·8 lb./ac. gave mean increases of 13·6 and 14·1 bu. No. 1 Green Mountain tubers per ac. ; ZnO at 14·4 lb./ac. gave a mean increase of 13·1 bu./ac. ; a Zn chelate at 6·5 lb./ac. gave no increase in yield. In Vancouver, drill applications of Zn sulphate and acetate resulted in gains of 46·7 and 30·0 bu./ac., respectively. Seed soaked for 2 min. in 0·08N $ZnSO_4$ and Zn acetate produced significantly higher yields than that soaked in distilled water, sulphuric or acetic acid. F. s.—A.M.H.

255 Department of Agriculture, Republic of Ireland. **Trial with aldrin conditioned fertilizer on potatoes.** *J. Dep. Agric. Republ. Ire.* 1956–57, **53**, 189–91.

In trials at 13 centres in 1955 and at 18 centres in 1956, 2, 4 or 6 lb. aldrin/ac., applied in a complete (NPK) fertilizer dressing gave good control of wireworms [*Agriotes* sp.] and had no effect on yield or quality (taint) of potato tubers.—A.M.H.

256 Lloyd, N. C. **Control of the potato moth.** *Agric. Gaz. N.S.W.* 1958, **69**, No. 5, 248–51, illus.

Potato moth [*Gnorimoschema operculella*] may be controlled by spraying in January and February with 0·1% DDT at 120–150 gal./ac. For commercial crops, low-volume spraying (1 lb. DDT in 10–20 gal. water/ac.) is more practicable, but does not always give complete control. Other control measures recommended are : increasing the humus content of the soil to reduce cracking, and hence tuber infection ; deep planting (6 in.) ; removing volunteer potato plants and susceptible allied weeds ; removing tubers as soon as possible after digging. Stored tubers may be protected by dusting with 2% DDT at 0·5 lb./bag or by fumigating with CS_2 (2 lb./1000 cu. ft. air space).—A.M.H.

257 Münster, J. Methode zur Beobachtung der

Entwicklung der virusübertragenden Blattlause zwecks Ansetzung des Früherntetermins und dessen Rückwirkungen auf den Ertrag an Saatkartoffeln. [**Methods for controlling the aphid vectors of viruses by means of early harvesting, and the consequences for the production of seed-potatoes.**] *Eur. Potato J.* 1958, **1**, No. 1, 31–41, bibl. 8, German, French and English summaries. [Sta., Féd. d'Essais Agric., Lausanne, Switzerland]

The importance of relating the date of early harvesting to the stage of development of the aphid virus vectors, and especially to the beginning and intensity of the mass flight, are stressed. Trials in 1953–5 at altitudes of 435–1250 m. indicated that early harvesting (after a growth period of 85–110 days) was economic only if sufficiently high yields (200 kg./are [1 are = 119·6 sq. yd.] for Bintje and 2·20 kg./are for Ackersegen) could be obtained by the harvest date. Such yields could only be reached if chitted tubers were planted. The growth period of the early-harvested crop was generally longest at altitudes of 600–900 m. Below 600 m., it was shortened by the earlier appearance of aphid vectors and above 900 m., by the later planting date. F. Eng. s.—A.M.H.

258 Jaehnl, G. Keimstimmung und Ertrag der Kartoffel. (Vorläufige Mitteilung). [**Induction of germination and yield of the potato. (Preliminary report).**] *Bodenkultur* 1958, **10**, No. 1, 27–33, bibl. 16, illus. [Bundesversuchsanst. alp. Landw., Gumpenstein, Irdning, Austria]

An account is given of experiments in 1955 and '56, in which seed tubers were subjected to different treatments which included wounding by shaking together in a container lined with glass-paper for 3 min. at 67 rev. per min., subsequent storage in a moist or dry condition for 3 weeks at 28–30°C., steeping in water, etc. Yields significantly higher than those of the control were obtained, in 3 out of 4 experiments, from the treatment in which the tubers were wounded and then stored under the wettest of the conditions tested. Wounding and induction of germination produced statistically significant increases in yield.—G.M.R.

259 Hemberg, T. **The significance of the inhibitor β complex in the rest period of the potato tuber.** *Physiol. Plant.* 1958, **11**, No. 3, 615–26, bibl. 22. [Bot. Dep., Roy. Pharmaceutical Inst., Stockholm]

A study was made of the sprout-inhibiting β complex of tubers of the Eigenheimer, Magnum Bonum and Majestic varieties, which have a very short, a medium-long and a very long, dormant period, respectively. Tubers were held in storage in dark, air-conditioned rooms and removed at different times during the period Oct.-Jan. in the case of Eigenheimer and Magnum Bonum and Oct.-March in the case of Majestic. After removal they were placed in wet sand at 20°C. to induce sprouting. Determinations were made of the extent of sprouting after 14 days. Chromatographic analyses of peel extracts were carried out on the same dates as the sprouting treatments began. Tubers of Eigenheimer showed maximum dormancy on 17 Oct.; dormancy progressively declined until 16 Dec., when it was considered that this variety had emerged from its rest period. With Magnum Bonum, dormancy was greatest in October; dormancy thereafter declined progressively to a very low level on 16 Dec. Majestic tubers were almost completely unable to sprout at the first 3 test dates on 17 Oct., 21 Nov., and 5 Dec. Some sprouts formed on tubers planted on 2 and 23 Jan. and sprouting thereafter increased progressively up to 31 March. In all 3 varieties, there was a distinct negative correlation between the incidence of sprouting and the content of acid growth-inhibiting substances (inhibitor β complex) in the peel.—P.B.

260 Davidson, T. M. W. **Dormancy in the potato tuber and the effects of storage conditions on initial sprouting and on subsequent sprout growth.** *Amer. Potato J.* 1958, **35**, No. 4, 451–65, illus., bibl. 10. [Dep. Agric., Edinburgh Univ.]

Apical sprout growth in potatoes is continuous after harvest at rates which increase with temperature to 80°F. but visible sprouting becomes apparent only when the sprout initial reaches 0·45 mm. Light has no influence and humidity may act slightly at lower temperatures. Varietal earliness in ripening is associated with longer interval from harvesting to visible sprouting. Rot, associated with fungal and frost damage, and certain chemicals stimulate sprouting. Storage at 35–40°F. is best for tuber soundness and minimal sprout growth but light is desirable at higher-temperature storage for seed purposes to avoid etiolation. Higher-temperature storage of tubers resulted in earlier emergence, earlier tuberization and lower final yields.—M.H.F.

261 Frimmel, G. Ein Beitrag zur Blütenphysiologie der Kartoffel. [**Contribution to the physiology of the potato flower.**] *Bodenkultur* 1958, **10**, No. 1, 20–6, bibl. 5. [Landw.-chem. Bundesversuchsanst. Linz, Austria]

Flower formation, berry formation, and pollen fertility were studied in some varieties of potato. It was found that the quality of the pollen differs not only with variety, but also exhibits remarkable differences within varieties and within individual inflorescences. Differences in flower quality are subject to certain rules, the nature of which is explained by the varietal flowering rhythm concerned. Herein it depends upon how far the course

of flowering is accompanied by vegetative growth, as it is through this interplay that the number of successively developing inflorescences is governed. From a knowledge of the optimal conditions for flowering one can determine which of the inflorescences contains the flowers with the most valuable pollen.—G.M.R.

262 CLAVER, F. K. and others. Efecto degenerativo de altas temperaturas durante la formación de los tubérculos de papa. [**Degenerative effect of high temperatures during the formation of potato tubers.**] *Rev. Invest. agríc., B. Aires* 1957, **11**, No. 3, 209–14, bibl. 7, illus. [Fac. Agron., La Plata, Argentina]

Two hundred tubers of the potato variety Katahdin imported from Canada, each cut in half and then placed in a laboratory in darkness on moist vermiculite, under which conditions no leaves grew. As soon as the first signs of tuber formation were evident, one half of each tuber was placed at low temperature (7·7°C. average) and the other half at high temperature (34·6°C. average). The plants grown from the small tubers, which had formed on the mother tubers at a high temperature during 71 days, yielded 57% less than the plants grown from tubers formed at a low temperature during the same period.—E.B.O.

263 SPARKS, W. C. **A review of abnormalities in the potato due to water uptake and translocation.** *Amer. Potato J.* 1958, **35**, No. 3, 430–5, bibl. 45, illus. [Idaho Agric. Exp. Sta., Aberdeen, Idaho]

264 GAUSMAN, H. W. and others. **Some effects of restricted soil aeration on potatoes.** *Amer. Potato J.* 1958, **35**, No. 4, 468–73, bibl. 7.

In pot experiments over 3 years with potatoes, under normal and restricted soil aeration, soil-CO_2 level was reduced by soil phosphate, while plant height and dry-matter yield were increased. Restricted aeration increased tuber production by 33·5% and the suggestion is that additional phosphate fertilizer might improve production when soil aeration is likely to be subnormal.—M.H.F.

265 GAUSMAN, H. W. and others. **Chloride deficiency symptoms in potato plants.** *Agron. J.* 1958, **50**, No. 7, 403, bibl. 4, illus. [Dep. Agron., Maine Agric. Exp. Sta., Orono]

The various symptoms shown by potato plants containing 0·0143–0·0381 me. Cl/g. dry weight are described. Treatment of leaflets showing Cl-deficiency symptoms with aqueous HCl solution containing 30 ppm. Cl prevented deficiency symptoms in the new growth.—A.M.H.

266 SCHWIMMER, S. and WESTON, W. J. **Chlorophyll formation in potato tubers as influenced by gamma irradiation and by chemicals.** *Amer. Potato J.* 1958, **35**, No. 6, 534–42, bibl. 13. [W. Utilization Res. and Devel. Div., U.S. Dep. Agric., Albany, California]

Gamma ray dosages of the order of 10 kilorads reduced chlorophyll formation in illuminated potato tubers. Increasing doses to 250 kilorads further decreased chlorophyll formation but did not completely suppress it. Tubers treated with the lower doses retained their residual ability to develop chlorophyll upon illumination after a period of dark storage, but in non-irradiated tubers this ability was less after a period of dark storage than when the tubers were illuminated immediately after irradiation. When applied to the surface of potato tubers, ATA inhibited chlorophyll development, but CIPC and O-methyl threonine did not. Tubers from plants whose leaves were sprayed with MH developed as much chlorophyll as the controls. Reflectance spectra of the exposed green surface of potato tubers suggested that carotenoid synthesis may be less sensitive to gamma irradiation than is the concomitant development of chlorophyll. [See also *Fld Crop Abstr.* 10 : 1067.] F.S.—A.M.H.

267 RAPPAPORT, L. and others. **Gibberellin on white potatoes.** *Calif. Agric.* 1958, **12**, No. 2, 4–5, illus.

Soaking tubers in gibberellin solutions accelerated sprouting and a 5-min. immersion in concentrations up to 5 ppm. was adequate and did not cause undesirable haulm modifications. Gibberellin could not overcome the chemical dormancy induced by maleic-hydrazide sprayings. Foliar spraying with gibberellin, 4, 2 and 1 week before potato harvest stimulated sprouting, and, when the tubers harvested from sprayed plants were cut and planted as setts, the rate of emergence was accelerated and was more marked with the earlier sprayings and heavier dosages (500 ppm. per plant).—M.H.F.

268 MACLEOD, D. J. and HOWATT, J. L. **The effect of gibberelin compounds on the shape of potato tubers.** *Amer. Potato J.* 1958, **35**, No. 7, 596–7, bibl. 4, illus. [Pl. Path. Lab., Fredericton, New Brunswick, Canada)

Treatment of stolon tips or terminal enlargements of roots with potassium gibberellate or gibberellic acid produced various tuber malformations, including elongated, spindled and dumbbell-shaped tubers with numerous shallow eyes. Tuber yield was not adversely affected.—A.M.H.

269 LIPPERT, L. F. and others. **Systemic induction of sprouting in white potatoes by foliar applications of gibberellin.** *Pl. Physiol.* 1958, **33**, No. 2, 132–3, bibl. 13, illus. [California Univ., Davis]

Foliar applications of gibberellin to potatoes 1, 2 or 4 weeks before harvesting markedly stimu-

lated sprouting, the effect being more pronounced with earlier and heavier applications. The results suggest that gibberellin is translocated to the tubers from the foliage. F.s.—M.H.F.

270 Harrison, E. M. and others. **Interaction of 2,4-D maleic hydrazide, and minor element uptake in potatoes.** *Amer. Potato J.* 1958, **35**, No. 3, 425–7, bibl. 5. [Agric. Exp. Sta., Colorado State Univ., Ft Collins, Colo]

Treatments applied to Red McClure potatoes were : (1) 2,4-D at 0·5 lb./ac. in 35 gal. water, (2) dust containing 1% 2,4-D + minor elements (B, Cu, Fe, Mn and Zn), (3) dust containing 5% 2,4-D + minor elements, (4) dust containing 1% 2,4-D, 2% MH + minor elements. 8 lb. of each dust were applied in 22 lb. dusting sulphur per ac. Treatments (1), (2) and (3) reduced total N in the tuber juice, compared with the untreated control, but treatment (4) increased it. All treatments significantly reduced catalase activity in the tuber juice. Treatments (1) and (4) significantly reduced sprouting ; (2) and (4) increased yields considerably, but the differences were not significant.—A.M.H.

271 Isleib, D. R. **Density of potato starch.** *Amer. Potato J.* 1958, **35**, No. 3, 428–9, bibl.2. [Mich. Agric. Exp. Sta., E. Lansing]

The density of starch from samples of 8 potato varieties grown at 3 locations in Michigan was determined. Despite the wide divergence in specific gravity and starch grain size of the varieties investigated, no significant differences between densities of the starch samples were found. F.s.—A.M.H.

272 Hori, S. **Histochemical studies on the starch formation from various sugars in relation to the permeability of potato tuber cells.** *Bot. Mag. Tokyo* 1958, **71**, No. 838, 127–30, bibl. 10. [Hokkaido Gakugei Univ., Kushiro, Japan]

Some sugars were capable of forming starch in cells of starch-free tubers. They were, in this order : glucose and sucrose > maltose > lactose > fructose and galactose > xylose. Mannose and arabinose failed to form starch and, unlike the above series of sugars, they caused cell plasmolyis.—D.B.

273 Duget, G. and Semere, S. Méthode rapide d'extraction et de dosage de la solanine. [**A rapid method for extracting and determining solanine (in potato tubers).**] *Ann. agron., Paris* 1957, **8**, No. 6 Bis, 141–50, bibl. 6, illus. [Sta. Cent. de Physiol. Vég., Versailles]

274 Hunsader, Mercedes L. and Hanning, Flora. **A possible relation between the degree of after-cooking discolouration and the optical density of extracts of Ontario potatoes.** *Amer. Potato J.* 1958, **35**, No. 6, 543–52, bibl. 16. [Wisconsin Agric. Exp. Sta., Madison]

275 Gull, D. D. and Isenberg, F. M. **Light-burn and off-flavor development in potato tubers exposed to fluorescent lights.** *Proc. Amer. Soc. hort. Sci.* 1958, **71**, 446–54, bibl. 20. [Cornell Univ., Ithaca, New York]

A survey of retail markets in 4 metropolitan areas of New York showed a wide range of light intensities (0–350 ft.-candles) to which potatoes were exposed. In 60% of cases the range was 20–60 ft.-candles. In tubers of Kennebec, Cherokee and Katahdin exposed to fluorescent lights at intensities of 25, 50, 75 and 100 ft.-candles, the amount of greening was significantly less at 25 ft.-candles than at 50 ft.-candles, but there was no difference in the amount of greening above 50 ft. candles. Kennebec greened most readily and Katahdin least. Covering tubers with red, blue, yellow or uncoloured polyethylene bags had no significant effect on greening. Five chelating compounds used as foliar sprays were effective in reducing greening of tubers on subsequent exposure to fluorescent light. Irradiation of tubers with ^{60}Co at 10,000 and 40,000 roentgens also reduced greening, but damaged the surface tissues and reduced quality. No appreciable taste differences were found between green and non-green potatoes. F. s.—A.M.H.

276 Magoon, M. L. and others. **Cytogenetic studies of South American diploid Solanums, section *Tuberarium*.** *Amer. Potato J.* 1958, **35**, No. 5, 375–94, bibl. 37, illus. [Dep. Genet., Univ. Wisconsin, Madison]

277 Artner, X. Durch Gründüngung sichere Kartoffelernten. [**Reliable potato harvests by means of green-manure crops.**] *Stärkekartoffel* 1958, **3**, No. 4, 1–2, illus. (In *Kartoffelbau* **9**, No. 7)

The reduction in soil fertility caused by increased mechanization in potato cultivation is more effectively remedied by cultivating green-manure crops than by applying stable manure. Examples are given of improved potato yields (a) on heavy soils, after clover/grass, grass alone, spring rye (alone or with legumes) and spring rape with mustard, and (b) on light soils, after fodder rye and winter rape. The increased and more dependable potato yields, especially in dry years, repay the cost of seed of the green-manure crops which also supply spring fodder.—D.B.

278 Button, E. F. and Hawkins, A. **Foliar application of urea to potatoes.** *Amer. Potato J.* 1958, **35**, No. 7, 559–72, bibl. 8. [Storrs Agric. Exp. Sta., Connecticut]

Foliar application of urea was an effective means for supplying part of the N for Katahdin potatoes under Connecticut conditions, but the results suggested that the amount of N applied in this way should not be more than 30–45 lb./ac.,

in not more than 4–6 weekly sprays, with sufficient N provided at planting time to prevent deficiency before all the sprays could be applied. No adverse effects on tuber quality resulted from foliar applications of urea. Applications late in the growing season tended to retard maturity and to reduce yields. F. s.—A.M.H.

279 Smith, C. S. **Potato storage on the farm.** *Fmr's Wkly, Lond.* 1958, **49**, No. 4, 83–4.

Practical details are given of cold-air-ventilated potato stores on farms in the Netherlands. A temperature of 35–39°F. within the pile is desirable and the cool-air fan should be capable of blowing 100 cu. m. of air per hr. per cu. m. of potatoes.—C.L.S.

280 Green, H. C. **Potato storage experiment 1955-56.** *Tech. Note 2 Nat. Inst. agric. Engng* 1956, pp. 6, bibl. 1. [N.I.A.E., Silsoe, Beds.] [Received Sept., 1958]

The presence of soil in the storage sacks or tubs appeared to be beneficial. It reduced drying-out of stored potatoes and possibly kept the temperature down and reduced loss of dry matter. Cuts were a relatively unimportant type of injury, and skinning was more serious than splitting. [See *Fld Crop Abstr.* 9 : 1297.]—A.M.H.

281 Boock, O. J. O uso de substâncias inibidoras da brotação de tubérculos de batatinha. [**The use of sprout inhibitors on potato tubers.**] *Bragantia* 1957, **16**, No. 7, 81–100, bibl. 34, illus., English summary.

In the trials described, the methyl ester of α - naphthaleneacetic acid (MENA) and 2, 3, 5, 6 tetrachloronitrobenzene (TCNB), both mixed with talc, were used to prevent sprouting in potatoes stored at different temperatures. At room temperature these treatments had little, or no effect. At 8°C. with an air relative humidity of 85%, MENA gave satisfactory results with tubers stored for 6–8 months. F. Eng. s.—E.B.O.

282 Nultsch, W. Untersuchungen über den Einfluss von Keimhemmungsmitteln (Carbanilsäureestern) auf das Kartoffelgewebe. [**The effect of sprout - inhibiting substances (urethanes) on potato tissues.**] *Angew. Bot.* 1958, **32**, No. 1–2, 27–44, bibl. 14, illus. [Biol. Inst. des VEB Fahlberg-List, Magdeburg, E. Germany]

The mechanism by which urethane inhibits sprouting was investigated. The practical outcome of the results is that urethane can be used for the storage of fodder- or ware-potatoes, but not for seed potatoes, because, unless the quantities and duration of application are under exact control, seed potatoes may lose their viability.—D.B.

283 Burton, W. G. **Experiments on the use of alcohol vapours to suppress the sprouting of stored potatoes.** *Eur. Potato J.* 1958, **1**, No. 1, 42–51, bibl. 17, English, French and German summaries. [Ditton Lab., D.S.I.R., Larkfield, Maidstone, Kent]

The suppression of sprouting in stored potatoes by ventilating them with growth-inhibiting vapours offers several advantages over the usual dusting methods. It is essential that the rate of ventilation with the air stream containing the vapour should be sufficiently rapid to prevent excessive dilution of the vapour with convective air. A rate of 100–150 l./min./1000 kg. of potatoes is suggested. Nonyl alcohol vapour at 0·05–0·12 mg./l. of ventilating air prevented sprout growth in bulks up to 165 metric tons, without impairing the cooking quality of the potatoes. The total cost of such a method is estimated at 4s./1000 kg. potatoes. It is essential that the treatment should be started as soon as the first signs of bud enlargement are observed on the potatoes on the top of the stack.—F. s.—A.M.H.

284 Burton, W. G. **The effect of the concentrations of carbon dioxide and oxygen in the storage atmosphere upon the sprouting of potatoes at 10°C.** *Eur. Potato J.* 1958, **1**, No. 2, 47–57, bibl. 31, English, French and German summaries. [Ditton Lab., D.S.I.R., Maidstone, Kent]

Sprout growth was inhibited at 10°C. by a concentration of 15% CO_2 in the storage atmosphere, decreased by lower concentrations, down to 6–7%, and stimulated by still lower concentrations. The optimum CO_2 concentration for sprout growth was 2–4%, which gave a concentration of 0·04–0·05 ml. CO_2/ml. cell sap. Sprout growth was stimulated by reducing the O_2 concentration in the storage atmosphere to 5%, or 0·006 ml. O_2/ml. cell sap. A reduced O_2 tension increased growth by increasing either sprout numbers or the number of cells in individual sprouts. Increasing the CO_2 tension increased the number of cells in the sprouts and caused marked cell elongation. The relationships between temperatures in the range 10–25°C., and the CO_2 and O_2 concentration in the cell sap, as affecting growth, are discussed. The possible mechanisms through which changes in CO_2- and O_2-concentration affect sprout growth are considered. F. s.—A.M.H.

285 Mackey, Andrea and Stockman, Joy. **Cooking quality of Oregon-grown Russet potatoes.** *Amer. Potato J.* 1958, **35**, No. 5, 395–407, bibl. 4, illus. [Oregon Agric. Exp. Sta., Corvallis]

Flavour, texture, moistness, smoothness when mashed and skin tenderness of Oregon-grown Russet potatoes did not change appreciably during 6 months' storage. Colour was better early in the storage period, and quality for boiling and steaming improved with storage. Larger potatoes were

nealier, regardless of cooking method, whereas maller ones showed slightly less tendency to break vhen boiled or steamed. Potatoes stored at 40°F. or 2 weeks before cooking, after previous storage it 30–36°F., had fewer sprouts, less rot and were easier to peel, than those stored at 75°F. for 2 weeks before cooking. Storage at 40°F. resulted in higher scores for mealiness, but a less desirable flavour than storage at 75°F. F. s.—A.M.H.

286 Sawyer, R. L. and Dallyn, S. L. **Timing maleic hydrazide sprays to stage of plant development.** *Amer. Potato J.* 1958, **35**, No. 8, 620–5, bibl. 6. [Long Island Veg. Res. Fm, Cornell Univ., Riverhead, N.Y.]

In 1953 and '54, 3 or 5 lb. MH/ac. gave excellent control of sprouting in stored Katahdin potatoes, when applied at blossom fall or shortly thereafter. If applied more than 2 weeks after blossom fall, 5 lb. MH/ac. were necessary. There were no effects on yield at any date of application. In 1955, application of MH at the early-bloom stage decreased yields of early- and late-planted tubers and application at the full-bloom stage decreased yield of early-planted tubers. Sprays at full bloom and blossom fall gave excellent sprout control. MH sprays had no effect on black spot or peeling discolouration. Late planting tended to decrease sprouting and black spot, but had no consistent effect on the specific gravity of the stored tubers.—A.M.H.

SWEET-POTATOES

287† Detilleux, E. La culture de la patate douce dans la région d'Elisabethville. [**Sweet-potato-growing in the Elizabethville region (Belgian Congo).**] *Bull. Inform. I.N.É.A.C.* 1958, **7**, No. 4, 237–60, bibl. 1, illus. [Sta. Exp. de Keyberg]

Information is given on methods for growing sweet-potatoes [*Ipomoea batatas*] in the Elizabethville region. A table shows the chemical composition of tubers and of leaves of many sweet-potato varieties grown at Keyberg. In a trial to compare the best introduced varieties grown on non-manured soil, Calabash Leave gave the highest root yield (19,410 kg./ha.), followed by Vanumuhini (15,165 kg./ha.); because of its high yield of leaves (23,190 kg./ha.) Vanumuhini was the best dual-purpose variety. Dressing with an organic-chemical fertilizer increased leaf yields significantly.—E.B.O.

288 Apte, M. V. **Sweet potato.** *Farmer, Bombay* 1958, **9**, No. 7, 6–8, illus.

Ipomoea batatas can be grown as an irrigated crop on varied types of soils throughout Bombay State and as a rain-fed crop where there is a well distributed rainfall of 80–100 in., as in the coastal regions of S. India. A brief account is given of preparatory tillage, manuring, irrigation, planting, weeding, pests, harvesting and yields. The variety B-4004, imported from the USA, is especially recommended. Besides yielding about 16,000 lb. tubers per ac., which is 50% above the yield of varieties developed in Bombay State, the tubers are formed at a shallower depth and there is less vine growth.—D.B.

289 Hsi, C. H. **Experiments with, and diseases on, sweet potatoes in Eastern New Mexico, 1953-55.** *Res. Rep. 8 Agric. Exp. Sta., New Mexico Coll. Agric. and Mech. Arts* 1956, pp. 10. [Received July, 1958]

Yields of 17 sweet-potato varieties in 1953 and '54 and of 18 varieties in 1955 are tabulated. B-5999, Oklahoma 17 and Allgold yielded well in 1953 and '54, but poorly in 1955. The reverse was true for B-6271 and Kandee. Over the 3 yr., Sunnyside gave the highest yields. Varieties with the best root quality and which stored best were Sunnyside, Kandee and Allgold.—A.M.H.

290 Olan, V. R. **Description of the different varieties of sweet potatoes.** *Phillipp. J. Agric.* 1955, **20**, No. 3–4, 159–73, bibl. 4, illus. [Bur. Pl. Industr., Philipp. Dep. Agric., Manila] [Received Sept., 1958]

Illustrated descriptions are given of the sweet-potato varieties: Bayambang, Bigsi, Binuboy, Binallena, Binalete, Bentong Denayoro, Iningcanto, Initlog, Inubi, Kadali, Kainday, Karingkit, Lubang, Morong, Sigurado, Rosales, Sinawa, Spongha, Tinambo, Tinayabas and White Star. Approximate yields vary between 1·38 tons/ha. for Binalete and 38·36 tons/ha. for Bayambang.—R.B.

291 Mou, T. S. and others. **The rearing of the new sweet potato varieties P_{30}, P_{10}, and P_{46} and their adaptation.** [Chinese] *Agric. Res. Taiwan* 1957, **7**, No. 1, 35–8, English summary. [Taiwan Agric. Res. Inst., Taipei]

The above varieties are suitable for extending the cultivation of sweet-potato (*Ipomoea batatas*) to the northern parts of Taiwan. P_{30} is resistant to *Sphaceloma batatas*; it gave a 30% higher yield than the control, and in quality it was superior to the local varieties. F. Eng. s.—D.B.

292 Ezell, B. D. and Wilcox, Marguerite S. **Variation in carotene content of sweet potatoes.** *J. agric. fd Chem.* 1958, **6**, No. 1, 61–5, bibl. 13. [U.S. Dep. Agric., Beltsville, Maryland]

Composite samples of sweet-potatoes of the varieties Orange Little Stem and Yellow Jersey taken from different sections of a 7500 sq. ft. plot in 1951, '52 and '55 were found to vary, within a variety, by as much as 45% in total carotenoids and 145% in carotene. Variations between seasons were considerable. Sweet-potatoes grown with limited soil-moisture contained more carotene than those grown with abundant moisture. Individual

roots from the same plant varied in carotene content by as much as 47% in Orange Little Stem and 82% in Yellow Jersey. Plants producing high yields of tubers contained significantly more carotene per unit weight of tuber than the plot average. Carotene content was more closely associated with the rate of tuber growth than with tuber size. The moisture-content of sweet-potato samples varied up to 3% within the same season. Ext.—R.B.

293 MILLER, J. C. and GAAFAR, A. K. **A study of the synthesis of carotene in the sweet potato plant and root.** *Proc. Amer. Soc. hort. Sci.* 1958, **71**, 388–90, bibl. 6, illus. [Louisiana State Univ., Baton Rouge]

In order to determine where carotene was synthesized, vines of a variety without carotene in the roots (Pelican Processor) were grafted onto roots of a high-carotene variety (Goldrush) and *vice versa*. Carotene was apparently synthesized in the root and not translocated from the leaves. F.s. —A.M.H.

294 KUWADA, H. and YAMAMOTO, K. **The form of existence of carotenoid pigments and the volume of carotene in sweet potatoes.** [Japanese] *Tech. Bull. Kagawa Agric. Coll.* 1956, **8**, No. 1, 15–18, bibl. 13, English summary.

Five *Ipomoea batatas* varieties (Hayato, Kyushu No. 12, Nancy-Hall, Kenroku and Norin No. 6) were examined for carotene in the central and cortical tissues of the tuberous roots at various stages of growth and storage. Carotene existed in crystalline and non-crystalline forms, and the amounts varied considerably in varieties and their tissues. F. Eng. s.—D.B.

295 AHMED, E. M. and SCOTT, L. E. **Pectic constituents of the fleshy roots of the sweet potato.** *Proc. Amer. Soc. hort. Sci.* 1958, **71**, 376–87, bibl. 24. [Dep. Hort., Univ. Maryland]

Pectic constituents were determined in 8 varieties of sweet-potatoes. Expressed as anhydrogalacturonic acid, they ranged from 3 to 5% of the fresh weight at harvest. The total anhydrogalacturonic-acid content decreased by *c.* 40% during 6 months' storage. F.s.—A.M.H.

296 DUNCAN, A. A. and others. **Effect of potassium chloride and potassium sulphate on yield and quality of sweet potatoes.** *Proc. Amer. Soc. hort. Sci.* 1958, **71**, 391–8, bibl. 15.

Yields of sweet-potatoes vars. Nemagold and Maryland Golden increased with increasing rate of K fertilization up to 480 lb. K_2O/ac. KCl gave higher yields than K_2SO_4 in 1956, but differences between them were not significant in 1954. At high K levels there was a larger % of over-size roots. Dry-matter content of the roots decreased with increasing K, and K content increased, both trends being more marked with KCl than with K_2SO_4. Variations in Cl content were small. In the 1956 crop, losses in weight during storage were less in the K treatments than in the controls. Firmness of processed sweet-potatoes was progressively decreased by increased K fertilization.—A.M.H.

297 KUSHMAN, L. J. and DEONIER, M. T. **Effects of weather, date of harvest, and curing treatments on keeping qualities of Porto Rico sweet potatoes.** *Proc. Amer. Soc. hort. Sci.* 1958, **71**, 369–75, bibl. 10. [U.S. Dep. Agric., Meridian, Mississippi]

Porto Rico sweet-potatoes were harvested at 7 dates over a period of *c.* 2 months in each of 3 yr. Reducing-sugar contents were very low, but total sugars increased from an average of 1·6% at the 1st harvest to 4·6% at the 7th harvest. The ascorbic-acid content was 32–44 mg./100 g. at the 1st harvest and decreased subsequently. On average, roots from the 3rd–5th harvests, made shortly after frost, kept best. After storage for 2–4 months at 60°F., without preliminary curing, an average of 75% of the tubers were externally sound. With preliminary curing for 28 days at 70°F., before storage at 60°F., 80% of tubers were sound; after 7 days' curing at 85°F., 84% were sound. There was no significant decrease in keeping quality following curing at 95°F. rather than 85°F., except after the 6th and 7th harvests. Internal breakdown increased at later harvests and with increased curing temperature. Partial or complete failure of wound periderm formation was often detected in late-harvested roots.—A.M.H.

CASSAVA

298 DUARTE, E. F. A mandioca e a sua cultura. [**Cassava-growing.**] *Agronomia, Rio de J.* 1956, **15**, No. 3, 155–80, bibl. 13, illus. [Received Sept., 1958]

The information given on cassava (*Manihot* sp.) is concerned with: its history, economic importance in Brazil, botanical description, varieties, climatic- and soil-requirements, cultural methods, yield, disease- and pest-control.—E.B.O.

299 CHANT, S. R. and MARDEN, J. A. **A method for the rapid propagation of cassava cuttings.** *Trop. Agric., Trin.* **35**, No. 3, 195–9, bibl. 6, illus. [Fed. Dep. Agric. Res., Moor Plantation, Ibadan, Nigeria]

A technique is described for the rapid multiplication of cassava by excising the young green shoots from the parent cutting. This stimulates the development of dormant buds and if care is taken in handling the excised shoots they will produce roots and grow in the normal way. Treatment with α-naphthalene acetic acid or indolyl butyric acid assists rooting, but survival of the cuttings may be

reduced when the hormone concentration is more than 10 ppm. F. S.—A.M.H.

YAMS

300 Department of Agriculture, Ghana. **Annual Report, 1955-56. Agronomic research.** *Rep. Dep. Agric. Ghana 1955–6*, 1958, 9.

At Wenchi and Ejura, yams grown in ridges yielded more than those grown in mounds. The top portion of the tuber proved better as setts than the middle or bottom portions. It was again confirmed that the optimum size of seed tubers was *c.* 2 lb.—G.L.S.

COCOYAMS

301 Department of Agriculture, Fisheries and Forests, Western Samoa. **Experimental treatments of taro infested with gaugau (*Tarophagus proserpina*, Kirk).** *Laufasi Ola, Inf. Circ. Dep. Agric. Fish. For., W. Samoa* 1957, **2**, No. 3, 9–10.

The leaf hopper, *T. proserpina*, on taro [*Colocasia antiquorum*] was controlled by dusting with 1% BHC at 6–7 lb./ac.—A.M.H.

GENERAL

302 Savile, A. H. and Wright, W. A. **Notes on Kenya agriculture. 3. Oil seeds, pulses, legumes and root crops.** *E. Afr. agric. J.* 1958, **24**, No. 1, 1–9.

Notes are given on climate, soils, cultivation, harvesting methods and major uses for the following root crops : cassava (*Manihot utilissima*), Irish potatoes, sweet-potato (*Ipomoea batatas*), eddo or taro (*Colocasia antiquorum*) and yams (*Dioscorea* sp.). Spacings, seed rates, yields per ac. and time to maturity are tabulated for each crop. [See also Abs. 202 and 350.]—A.M.H.

FIBRE CROPS

COTTON

See also Abs. 379, 422, 437, 444, 483, 494

303 Giles, W. L. **Cotton improvement through advances in production practices in 50 years.** *Agron. J.* 1958, **50**, No. 7, 349–51, bibl. 7. [Delta Branch, Mississippi Agric. Exp. Sta., Stoneville]

Improvements in yield, efficiency of production and staple length of US cotton during the past 50 yr. are discussed. Similar improvements were apparent when cotton production in Mississippi alone was considered, thus eliminating the effects of land selection resulting from acreage control and the shift of cotton production from the less fertile south-eastern areas to irrigated western areas where boll weevil is not prevalent. The development of mechanization and the use of fertilizers, herbicides and insecticides are discussed.—A.M.H.

304 Indian Cotton Growing Review. **Paddy lands of Cauvery delta offer great scope for cultivation of cotton in the off-season.** *Indian Cott. Gr. Rev.* 1958, **12**, No. 2, 104.

An average yield of 970 lb. seed cotton per ac. and a net profit of Rs. 375 per ac. can be obtained by growing cotton on paddy land between 2 rice crops, adopting the following procedure : (1) cotton seed is dibbled into the rice stubble within a week of harvesting the rice crop, without first ploughing the land ; (2) $(NH_4)_2SO_4$ is applied at 1 cwt./ac. after the first hoeing and again at flower-bud formation ; (3) the land is irrigated during flowering and boll formation. [See also *Fld Crop Abstr.* 11 : 278 and 1489.]—D.B.

305 Anson, R. R. **Report to the Government of Indonesia on cotton production.** *Rep. 725 FAO* 1957, pp. 19.

This report results from a reconnaissance survey, especially in eastern Indonesia, to determine the areas suitable for cotton production and to prepare a programme of cotton investigation there. Cotton is grown sporadically in many of the drier regions of Indonesia.—E.B.O.

306 Indian Cotton Growing Review. **H.14.—The new superior American cotton for the Hariana tract of Punjab.** *Indian Cott. Gr. Rev.* 1958, **12**, No. 2, 105.

H.14 replaces 216 F. It is more than a fortnight earlier in maturing than 216 F, and its yield of seed cotton is about 90 lb./ac. higher.—D.B.

307 Khan, A. H. **Lasani-II. A new, long-staple variety of cotton for Multan Tract.** *Pakist. Cotts* 1958, **2**, No. 3, 10.

Lasani-II, developed at Multan, is a tall variety with 3–4 fairly strong vegetative branches. Its hairiness gives resistance to attack by jassids. It has long, medium-sized bolls, ready for picking in late October or early November. It yields best when sown at the end of May or beginning of June and manured with 250 lb. $(NH_4)_2SO_4$ per ac. It yields approx. 123 lb./ac. more seed cotton than variety 124F which, at the present time, is the most important commercial variety of Pak-American cotton grown in the district of Multan. Lusani-II has a staple length of 1·125–1·187 in. and a ginning out-turn of 32·7%. This variety is approved by the West Pakistan Department of Agriculture and by the Pakistan Central Cotton Committee, for general cultivation, instead of 124F, in Multan district.—D.B.

308 Nicholson, G. E. **A note on Ethiopian cottons.** *Emp. Cott. Gr. Rev.* 1958, **35**, No. 3, 160–7, bibl. 27, 1 map.

The species collected, which are chiefly representative of the south, south-west, north-east and east of the country, included only cultivated ones ; no wild cottons were found. Spp. collected included : *Gossypium hirsutum* var. *punctatum*, *G. hirsutum* × *G. hirsutum* var. *punctatum*, *G. barbadense* and *G. herbaceum* var. *acerifolium*. It is possible that the last was the first cotton introduced into Ethiopia, but it may have replaced *G. arboreum* race *soudanense*. *G. hirsutum* var. *punctatum* forms the basis of the present industry.—A.M.H.

309 Agronômico, Campinas. Novas variedades de algodão. [**New cotton varieties.**] *Agronômico, Campinas* 1958, **10**, No. 1–2, 1–4.

In São Paulo, Brazil, where about 90% of the cotton grown is the variety I.A. Campinas 817, there is a programme for replacing, during the next 5 years, the present varieties with new varieties having a higher quality fibre. The variety IAC-8, now being multiplied, will be grown on 70% of the area in 1959–60. It is estimated that in 1962–3 60% of the area will be grown with IAC-9 and 30% with IAC-13.—E.B.O.

310 Ju-Shen, H. and Tsing-Hai, C. **The protective effect of some growth-stimulating substances and minor elements on cotton seedling diseases.** [Chinese] *Acta pathol. sinica* 1957, **3**, No. 2, 183–91, bibl. 14, English summary. [Nanking Agric. Coll.]

When cotton seeds were soaked for 24 hr. in a 0·3% solution of each of potassium bromide, copper sulphate, zinc sulphate and magnesium sulphate, 0·1% solutions of boric acid and of manganous sulphate, a 0·01% solution of nicotinic acid, and α-naphthaleneacetic acid at 5 ppm., the rate and percentage of germination increased. In field experiments, seed treatment with growth substances and minor elements reduced disease incidence to 45–81% of the incidence in control plants. Some of these compounds (nicotinic acid, potassium bromide, manganous sulphate and hydroquinone) promoted germination and considerably reduced disease incidence. The growth-stimulating substances and minor elements were not toxic to the fungi causing diseases on cotton seedlings. Therefore, the protection given by these substances could not be attributed to a fungicidal action. F. Eng. s.—D.B.

311 Erwin, D. C. and Reynolds, H. T. **The effect of seed treatment of cotton with thimet, a systemic insecticide, on Rhizoctonia and Pythium seedling diseases.** *Pl. Dis. Reptr* 1958, **42**, No. 2, 174–6. [Univ. California Citrus Exp. Sta., Riverside]

Following reports of poor emergence of cotton from seed treated with thimet in combination with fungicides (mostly ceresan 200, ceresan M-2X, or panogen), glasshouse trials were conducted to study the effect of thimet (as thimet 44D at 8 lb. per 100 lb. seed) alone, or in combination with ceresan 200 (at 1 oz. per 100 lb. seed), on the emergence of cotton seed sown in sterilized or unsterilized soil. There was some evidence of a fungistatic effect of thimet on *R. solani*, but not on *P. debaryanum*. The emergence of seed treated with thimet + ceresan 200 in unsterilized soil was much lower than that of seed treated with ceresan 200, only. There was evidence that thimet or its carrier appeared to inhibit the fungicidal effects of ceresan 200. Mixing captan at either 4 or 1·6 oz. active ingredient per 8 lb. thimet resulted in much greater emergence than where thimet, or thimet + ceresan 200, were used.—P.J.B.

312 Schmitz, G. *Helopeltis* du cotonnier en Afrique centrale. [***Helopeltis*, a cotton pest in central Africa.**] *Série sci. 71 I.N.É.A.C.* 1958, pp. 178, bibl. 332, illus.

An account is given of observations on *Helopeltis schoutedeni*, one of the principal pests of cotton in northern Congo, and of trials for its control, carried out in the Uele, mainly at Bambesa Station. To protect cotton in infested areas, it is recommended that : (a) all cotton residues be pulled up early ; (b) pierced plants be destroyed during the first 2 months of growth ; (c) fields should be inspected regularly and larvae collected. From trials on chemical control it is concluded that *H. schoutedeni* can be controlled by dusting with DDT, or toxaphene, once about 3 months after sowing (10–30 Sept. for crops sown during 15–30 June ; 25 Sept.–15 Oct. for those sown in July.)—E.B.O.

313 Fadígas, M. and others. Experimentos de pulverizações com inseticidas sistêmicos em baixo volume para o contrôle de algumas pragas iniciais do algodoeiro. [**Trials to control some pests of cotton by low-volume sprays of systemic insecticides.**] *Biológico, S. Paulo* 1958, **24**, No. 5, 75–9, bibl. 2.

In plot trials in São Paulo, Brazil, in 1957–8, various insecticides were tested for controlling *Aphis gossypii*, *Tetranychus telarius* and *Hemitarsonemus latus* on the cotton variety IAC. 817, sown on 31 Oct. The plants were sprayed twice (31 Dec. and 10 Feb.). The best treatment, which controlled satisfactorily *A. gossypii* and *H. latus*, was endrin 400 g. active principle plus metasystox 170 g. a.p. per alqueire paulista (= 24,200 sq.m.). [See also *Fld Crop Abstr.* 11 : 1172 and 1174.]—E.B.O.

314 Reynolds, H. W. **Control of the cotton root-knot nematode on extra-long-staple cotton.** *Pl. Dis. Reptr* 1958, **42**, No. 8, 944–7, bibl. 2, illus. [Agric. Res. Serv., Cotton Res. Center, Tempe, Arizona]

The economic importance of the cotton root-knot nematode (*Meloidogyne incognita acrita*) on

Gossypium barbadense is discussed. Effective control measures are : rotation of cotton with resistant lucerne varieties, e.g. African or Chilean, or with small-grain crops and grain sorghum ; summer fallowing ; soil fumigation. The results of a field-scale fumigation experiment are reported in which bromofume 85 (83% 1,2-dibromoethane), DD and nematox 45 (45·4% nemagon) were used as pre-emergence treatments, and a granular form of nemagon as a post-emergence treatment. The pre-emergence treatments gave significant increases in yield.—A.M.H.

315 HANNA, R. L. **Insecticidal seed treatments for cotton.** *J. econ. Ent.* 1958, **51**, No. 2, 160–3. [Texas Agric. Exp. Sta., College Station]

Tests carried out during 1954–6 showed that demeton, American cyanamid 12008 and 12009, thimet, and Bayer 19639 applied as seed treatments adequately protected young cotton plants, for a period of 4–6 weeks from sowing, against attack by the thrips spp. *Frankliniella fusca* and *F. tritici*. Some phytotoxicity was observed but there was no significant reduction in yield from any of the treatments. F. ext.—R.B.

316 FRANQUEN, P. de. Essais de lutte contre le "shimbu". [**Trials to control "shimbu".**] *Bull. Inform. I.N.É.A.C.* 1958, **7**, No. 2, 117–25, bibl. 2.

" Shimbu " is the name given to the damage caused collectively to cotton by an insect related to the genus *Gueriniella*, by ants, and a fungus (*Macrophoma phaseoli*). From a series of trials it is concluded that insecticidal dusts based on dieldrin, chlordane and aldrin are effective against shimbu when applied to the soil at the minimum rate of 1250 g. of active material per ha. for dieldrin and aldrin, and 2000 g. for chlordane. The soil remains disinfected for at least a year.—E.B.O.

317 PRESLEY, J. T. **Relation of protoplast permeability to cotton seed viability and predisposition to seedling disease.** *Pl. Dis. Reptr* 1958, **42**, No. 7, 852. [Crops Res. Div., Agric. Res. Serv., U.S. Dep. Agric.]

At 100% R.H., temperatures of 30°C. or below for 25 days did not appreciably affect cotton seed viability. Fifteen days at 40°C. or 4 days at 50°C. reduced germination and 6 days at 50°C. inhibited it. The degree of injury or deterioration of the seed could be detected by differences in the conductivity of distilled water leachings. A fairly accurate measure of differences was possible after soaking for 15 min. at 50°C.—A.M.H.

318 WHITE, H. B. **Fat utilization and composition in germinating cotton seeds.** *Pl. Physiol.* 1958, **33**, No. 3, 218–26. [Columbia Univ. New York]

319 BHATT, J. G. **Differential behaviour in yield of American and Desi cotton varieties in Malwa tract to treatment with several plant hormones.** *Indian Cott. Gr. Rev.* 1958, **12**, No. 2, 80–2, bibl. 6. [Scheme for Cotton Physiol. Res., Inst. Pl. Ind., Indore]

An aqueous solution of 10 ppm. of each of the hormones 2,4-D (K salt), IPA, IAA, IBA, PAA, NAA and TIBA was sprayed at 80 gal./ac. on American Upland cotton variety Indore-1 (*Gossypium hirsutum*) and Desi cotton variety Bhoj (*G. arboreum*) to investigate the effect of plant-growth substances on yield of seed cotton. These produced no noticeable effect on the yield of the American variety, but, with the exception of IBA, produced yield increases, ranging from 13·6 to 49·8%, in desi cotton. The different response of the 2 cotton varieties is attributed to differences in genetic constitution. [See also *Fld Crop Abstr.* 11 : 733.]—D.B.

320 LORENZO, J. R. Indices tecnológicos de los algodones producidos comercialmente en la República Argentina. [**Technological characteristics of cottons grown commercially in Argentina.**] *Rev. Fac. Agron., B. Aires* 1957, **14**, No. 1, 108–40, English summary.

The length, uniformity, strength, and fineness of cotton lint, as well as the oil- and protein-content of cotton seeds, were determined.—E.B.O.

321 RAMASWAMI, V. and others. **A comparison of the different methods of estimating earliness in cotton.** *Indian Cott. Gr. Rev.* 1958, **12**, No. 2, 108–10. [Cott. Br. Sta., Coimbatore]

322 BANNINK, L. La fumure minérale du cotonnier. [**The chemical manuring of cotton.**] *Bull. Inform. I.N.É.A.C.* 1958, **7**, No. 4, 199–211, bibl. 1. [Sta. Tech. Agron., Bambesa, Belgian Congo]

The results from preliminary trials at Bambesa before 1953, showed that P is the most important fertilizing element in red clay soils with a high iron content [see *Fld Crop Abstr.* 9 : 189]. From further trials it was concluded that applications of P_2O_5 greater than 100 kg./ha. are uneconomical. The application of this fertilizer when localized near the plants should not exceed 50 kg./ha. Higher applications than this should be broadcast.—E.B.O.

323 VANDECAVEYE, S. C. and WILLIAMS, B. C. **Effect of fertilizers on cotton.** *Res. Rep. 11 New Mexico Agric. Exp. Sta.* 1957, pp. 6.

Increases in seed-cotton yields on irrigated clay loam in New Mexico were greater where P alone was applied than where N alone was given. The highest yield, 2703 lb./ac. (control, 2199 lb./ac.) was obtained where 270 lb. N/ac. and 50 lb. P_2O_5/ac. were applied. Trials with NPK fertilizers on irrigated loamy sand showed that, except where

4–4–4 (NPK) organic fertilizer was applied, more than 80 lb. N/ac. were needed to produce substantial increases in yield. K applications had no appreciable effect on growth or yield. In most of the plots on this soil P was applied at 60 lb. P_2O_5/ac. To obtain high yields where cotton crops on sandy soil do not follow legumes receiving high P applications, applications of more than 150 lb. N/ac. and 60 lb. P_2O_5/ac. are recommended.—R.B.

324 Pack, M. R. **Fertilization of cotton on soil unusually high in organic matter.** *Res. Rep. 3 Agric. Exp. Sta., New Mexico Coll. Agric. and Mech. Arts* 1955, pp. 3. [Received July, 1958]

On a loam-to-silt-loam soil containing 17·6% $CaCo_3$, 3·4% organic matter and 3 ppm. available P, N at 40 or 80 lb./ac. had no significant effect on seed-cotton yields. 40 lb. P_2O_5/ac. increased yields where no N was applied, but where 40 lb. N/ac. was applied, 80 lb. P_2O_5/ac. were required to produce a significant increase. The 80 lb. rate of N masked any benefits from P.—A.M.H.

325 Neves, O. S. and Freire, E. S. Adubação do algodoeiro 3. Ensaios sôbre a aplicação de azôto em cobertura. 4. Ensaios sôbre época de aplicação de azôto e potássio. [**Cotton manuring. 3. Trials in applying N as a top-dressing. 4. Trials on time of applying N and K.**] *Bragantia* 1957, **16**, No. 16, 223–42, bibl. 19 and No. 20, 269–96, bibl. 15, English summary.

In 3 cotton trials at Mococa, Tietê and Tatuí experiment stations, São Paulo, Brazil, in 1937–42, the usual method of applying N, immediately before sowing, was compared with N applied as a top dressing. The 2 methods gave the same results at Mococa, but at Tietê and Tatuí N applied before sowing increased yields only slightly, or even depressed them, whereas it increased them appreciably where applied as a top-dressing. In trials in 1949–54 in 7 localities comprising the main soil types of São Paulo State, P was applied at sowing, whereas N and K were applied at sowing, 30–40 and 60–80 days after emergence. The response to N, as shown by cotton yields, was generally much greater when it was top-dressed 30–40 days after emergence than when it was applied at sowing; the former date of application was also better than at 60–80 days after emergence. Top-dressing with K was generally inferior to application at sowing, but, to avoid injuring the seed, K should not be applied in contact with it.—E.B.O.

326 Empire Cotton Growing Corporation. **Progress reports from experiment stations. Season 1956-57. Kenya.** London, 1958, pp. 14.

1. District trials, Nyanza Province, pp. 4–6. In 1955–6, DE 715/6 was more resistant than S47 to *Verticillium dahliae* and had a better yarn appearance, but their yields were similar. In 1956–7, S47 and Uk51 significantly outyielded Uk48 at 2 centres and were also better than DE 715/6 at one of them. Sowing in May gave optimum yields in both seasons.

2. Insecticide trial, Lake Victoria shore area, p. 8. Five applications of 16 lb. 3% γ BHC and 10% DDT dust [per ac.] at 10-day intervals resulted in the highest yield.

3. Coast Province, pp. 10–14. Uk51 and Uk48 outyielded 47/10 and N17; Uk51 gave the highest yield. In mulched plots, sowing in mid-April gave the best yields. In unmulched plots, early- and mid-April sowings outyielded later ones. At the early- and late-April sowings, the unmulched plots yielded significantly more than the mulched, but at other sowing dates differences in production were small. Cotton interplanted with maize again yielded less than an equivalent area of pure cotton. —A.M.H.

327 Empire Cotton Growing Corporation. **Progress reports from experiment stations. Season 1956-57. West Indies.** London, 1958, pp. 10.

1. Date of sowing, pp. 1–2. The sowing season for cotton in Montserrat was changed from February-April to September-October [see *Fld Crop Abstr.* 10: 234]. No deterioration in cotton quality has so far been found. In St. Kitts, sowing date was changed from May to August.

2. Manuring and spacing trials, pp. 3–5. In Montserrat, N increased cotton yields and P gave small, but not significant, increases. Response to different spacings was variable, but in most cases increases were obtained by leaving 1 plant per hole in preference to 2, at a constant population per ac.

3. Variety trials, pp. 6–8. In St. Vincent, MSI and Seabrook 12-B-2 were more resistant to *Fusarium* wilt than other cotton varieties. In Montserrat, with the changed sowing season, VH 8 did as well as MSI, in contrast to previous results. VH10 outyielded MSI and VH8 in Antigua and Montserrat. Seabrook, BAR XLI and BAR XL3 yielded more than BSI.—A.M.H.

FIBRE FLAX

328 Ministry of Agriculture, Northern Ireland. **The growing and harvesting of flax.** *Leafl. 94 Minist. Agric. N. Ire.* 1957, pp. 6, illus.

329 Larsen, A. Rusketidsforsøg med spindhør til rødning. [**Trials on dates of pulling fibre flax for retting.**] *Tidsskr. Planteavl* 1958, **62**, No. 2, 259–79, English summary.

In trials during 1951–6 at Aarslev in Denmark, fibre flax was harvested on the following average dates: 12, 18 and 25 July, 1, 7, 15 and 22 August. These harvest dates ranged from a stage when the crop was green and the earliest-formed seed cap-

sules still soft, to a stage when about half the straw was brown and half yellow, with all seed capsules containing mature seed. The mean yields of unseeded straw at the 7 harvest dates given were as follows (hkg./ha.): 58·8, 63·7, 67·2, 69·2, 69·3, 68·1 and 65·4, respectively. Mean seed yields (hkg./ha. ; 10% moisture content) were as follows: 2·3, 5·4, 8, 9·6, 9·6, 9·3, and 7·6, respectively. Mean yields of scutched fibre (kg./ha. ; warm-water retting) were as follows : 586, 652, 704, 743, 744, 713 and 688, respectively. Tow yields were highest at the last 2 harvest dates. The fibre length of the scutched fibre was greatest at the 3rd and 4th harvest dates, breaking strength was greatest at the 4th date, while cleanness and fibre lustre were best at the 3rd and 4th dates. The results showed that highest yields of scutched fibre, best fibre quality and highest seed yields were all obtained at the 4th–5th harvest dates, i.e., 3–4 weeks after the end of flowering and when most plants no longer have many green or greenish leaves on the uppermost third of the stalks.—P.J.B.

330 SIMÓR, P. Om linodling och -beredning i Ungern jämte spinnförsök med linfiber av olika ursprung. **On flax breeding and processing in Hungary and results from spinning flax fibre of different origin.** *Lin* 1958, **12**, 1–2, 10–15, English summary. [Svenska Textilforskningsinstitutet, Göteborg, Sweden]

The types of fibre flax grown in Hungary and their fibre quality are reviewed.—P.J.B.

331 FRITZCHE, R. Die Bekämpfung der Leinerdflöhe. [**Control of flax flea-beetle.**] *Dtsch. Landw.* 1958, **9**, No. 4, 184–8, bibl. 6, illus. [Inst. Phytopath., Aschersleben, E. Germany]

The best means for controlling *Aphthona euphorbiae* and *Longitarsus parvulus* on *Linum usitatissimum* was treatment of the soil, shortly before sowing, with a lindane preparation at 35 kg./ha. When there is a mass infestation of the beetles in the spring, dusting the crop with a contact insecticide is also necessary.—D.B.

332 JORDAN, L. S. **Effects of the interaction of varying temperatures and light intensities on the response of flax to 2,4-D (2,4-dichlorophenoxy-acetic acid.)** *Diss. Abstr.* 1958, **18**, No. 4, 1230–1. [Univ. Minnesota, St. Paul]

Flax plants were grown in controlled environments at temperatures of 65, 75 and 85°F. and light intensities of 200, 500, 800 and 1100 ft.-candles both before and after spraying with 2,4-D amine at 6 oz./ac. Temperature and light intensity both before and after treatment had a marked influence on the effects of 2,4-D treatment, the greatest responses occurring at the lowest light intensities and at the highest temperatures. It was concluded that injury to flax in the field caused by spraying with 2,4-D would be greater under hot, cloudy conditions than in cool weather with bright sunshine. —R.B.

333 FREDERIKSEN, P. S. Kvaelstofgødning til spindhør med korn eller bederoer som forfrugt. [**Nitrogenous manuring of fibre-flax with cereals or beet as preceding crops.**] *Lin* 1958, **12**, No. 1–2, 1–9, bibl. 20, English summary.

The results are given of 20 trials in different parts of Denmark during 1951–5. Fibre flax was treated with 0, 50, 100, or 200 kg. calcium nitrate /ha. or 100 kg. ammonium sulphate. The average un-deseeded straw yield of controls was 6424 kg. /ha.; treatment with the above amounts of N fertilizer increased yields by 281, 736, 1165 and 678 kg./ha., respectively. Yields of scutched fibre averaged 724 kg./ha. for controls and were increased by 47, 78, 77 and 74 kg., respectively, by the N treatments. It was concluded that amounts of 125 –150 kg. calcium nitrate/ha. were the most profitable. Ammonium sulphate was less effective than calcium nitrate, because of its slower availability.—P.J.B.

JUTE

See also Abs. 425, 494

334 GURNANI, K. L. **Income from jute fields up 23 per cent.** *Indian Fmg* 1958, **8**, No. 4, 6–7, illus. [Jute Agric. Res. Inst., Barrackpore, W. Bengal]

Production costs have been reduced by 17%, [fibre] yields increased by about 290 lb./ac., their quality improved, and income increased by 23% by practising improved methods for jute cultivation, retting, and fibre extraction. Double- and triple-cropping is practised. With triple croppine (on low-lying or irrigated land) the crop sequence is jute, rice, pulses.—D.B.

335 TU, D. S. and others. **Experiments on the introduction of jute plants to the northern provinces of China.** [Chinese] *Acta Agric. sinica* 1957, **8**, No. 4, 424–36, bibl. 9, English summary. [N. China Agric. Res. Inst., Peking]

In order to restore the production of jute to northern China, experiments were conducted in 1955 and '56, in areas near Tientsin and Peking with seed of jute varieties from southern China. In N. China regions, the soil temperature suitable for sowing jute (17–18°C. at a depth of 10 cm.) is reached in mid-May. When grown in North China the southern varieties flowered but did not set seed ; their stem height and fibre yield were higher than when grown in South China, and their fibre strength and sack-making qualities were greater than jute produced in Chekiang (S. China) or in Pakistan. The experiments have shown that jute varieties from southern China can be grown in the

states of Shantung, Honan and Hopei, and even as far north as Liaoning (latitude 41°N.). They can be grown on low-lying land if their possible submergence in water occurs late and the depth of water does not exceed 20 cm. *Corchorus capsularis* is more resistant to submergence than is *C. olitorius*. Jute has been satisfactorily intercropped with Irish potatoes, the jute being sown between the potato rows 1 month before harvesting the latter crop. A slightly lower yield of potatoes is compensated by an extra jute crop. F. Eng. s.—D.B.

336 Allen, E. F. **A note on jute cultivation in Malaya.** *Malay. agric. J.* 1958, **41**, No. 1, 35–8, illus.

Corchorus capsularis, variety Segama, from North Borneo, is recommended for Malaya, where it can be grown successfully as an off-season crop in parts of the Tanjong Karang irrigation area on the Selangor coast. It yields 760–1000 lb. of sun-dried fibre per ac.—E.B.O.

337 Summers, T. E. and others. **Progress report on retting kenaf and jute ribbons.** *Proc. Soil and Crop Sci. Soc. Fla* 1956, **16**, 307–13, bibl. 10. [Agric. Res. Serv., U.S.D.A. and Florida Agric. Exp. Sta., Belle Glade]

Tank-, canal-, moist-chamber- and stack-retting methods were compared.—A.M.H.

URENA LOBATA

338 Department of Agriculture, Ghana. **Agronomic research.** *Rep. Dep. Agric. Ghana 1955–6*, 1958, 8.

At Ejura, *Urena lobata* yielded at the rate of 826 lb. dry fibre per acre. From trials it was found that the best quality fibre was obtained after retting for 2 weeks.—G.L.S.

OIL CROPS

SESAME

See also Abs. 350

339 Chakravarti, S. C. and Abraham, N. J. **Effects of gibberellic acid on the flowering of *Sesamum indicum* L.** *Proc. nat. Inst. Sci. India (B)* 1958, **24**, No. 2, 89–93, bibl. 17. [Govt Hamidia Coll., Bhopal]

It appears that gibberellic acid has no florigenic property. Its effect in bringing about an early termination of the vegetative cycle in certain annual and biennial plants with 2 distinct phases of growth, one of rosette formation and the other of stem elongation and flowering, is an indirect one. F. s.—D.B.

OIL-SEED FLAX

See also Abs. 350

340 Joglekar, R. G. and Deshmukh, N. Y. **Cross 4-29. An improved strain of linseed for Vidarbha.** *Indian Oilseeds J.* 1958, **2**, No. 3, 10–12. [Govt Exp. Farms Jabalpur and Nagpur, Bombay State]

Compared with local varieties of *Linum usitatissimum*, Cross 4-29 has larger, lighter-coloured seeds, ripens 7–10 days earlier, and gives a 6–9% higher yield of seeds, which contain 11% more oil. Its performance was outstanding against improved strains from other states of India. It is recommended for Vidarbha because it combines high yield and high oil-content with rust resistance.—D.B.

341 Centro Regional Pampeano de Investigaciones Agrícolas, Argentina. Catalogación de variedades de lino oleaginoso. [**Catalogue of varieties of oil-seed flax.**] *Rev. Invest. agric., B. Aires* 1957, **11**, No. 3, 287–98, bibl. 13.

Information is given on the following varieties of oil-seed flax : P.330 M.A., Querandí M.A., Charrúa M.A.G., Tezanos Pinto Entrerriano M. A.G., Pergamino Pampa M.A.G., Oliveros Toba M.A.G. and Pergamino Puelche M.A.G.—E.B.O.

342 Mathur, B. P. and others. **Differential response of linseed varieties to various doses of nitrogen and phosphate and their method of application.** *Indian Oilseeds J.* 1958, **2**, No. 2, 89–93, bibl. 12. [Indian Agric. Res. Inst., New Delhi]

Seed yield (but not oil content) of *Linum usitatissimum* was increased by N as ammonium sulphate, the optimum dose being 20 lb. N/ac. P as superphosphate at 60 lb. P_2O_5/ac., either alone or in combination with N, did not appreciably increase seed yield. The highest fibre yields were obtained without fertilizers. Compared with broadcasting the fertilizer, its placement below soil level slightly increased the oil content.—D.B.

SAFFLOWER

343 Department of Agriculture, Cyprus. **Safflower (*Carthamus tinctorius*).** *Rep. Dep. Agric. Cyprus 1957*, 1958, p. 47.

In varietal trials with safflower (*Carthamus tinctorius*), I–52–260, introduced from Australia, yielded best. The best results were obtained by sowing in rows 2 ft. apart at the rate of 3 okes (1 oke = 2·8 lb.) of seed per donum (0·33 ac.).—E.B.O.

SUNFLOWER

See also Abs. 350, 352, 358, 370, 371, 373

344 Pazourek, J. Vliv hustoty výsevu na růst slunečnic. **Effect of density of planting on growth of sunflowers.** [Czech] *Ann. čsl. Acad. agric. Sci., Pl. Prod. Ser.* 1958, **4** (**31**), No. 5, 531–58, bibl. 23, Russian, English and German summaries.

The following densities were tested : (1) seed sown separately at distances of (in cm.) 5 × 5, 10 × 10, 20 × 20 and 40 × 40 ; and (2) seed sown 5 in each pocket at these distances. The data are considered in regard to plant height, weight of above-ground parts, average area of a leaf, weight of one seed, and size of flower parts. F. Eng. s.—M.H.

345 Morozov, V. K. **Hollowness of sunflower seeds, its causes and forms in the South-east [of European USSR].** [Russian] *Doklady Akad. Nauk SSSR (Proc. Acad. Sci. USSR)* 1958, **120,** No. 6, 1359–61, illus. [Sci. Res. Inst. Agric. S.-East, Saratov]

Hollow seeds in *Helianthus annuus* occur most widely in crops of the South-east where 30–40% of the sowings may be affected. Two forms of the disorder are found (sometimes on the same plant) ; one affects seeds in the central part of the capitulum while the other affects parts nearer the periphery. In dry regions, the first type comprises 70–80% of all empty seeds. From a study of the anatomy of the capitulum and observations in the field, it is concluded that one cause of hollow seeds is a deficiency in water supply. Control measures suggested include : (1) regulating the soil moisture in all horizons and ensuring an adequate supply of water to the plant at the period preceding flowering ; and (2) selection of varieties from types in the South-east which are the least susceptible to hollow seeds.—M.H.

346 Greenshields, J. E. R. and Putt, E. D. **The effects of 2,4-D spray drift on sunflowers.** *Canad. J. Pl. Sci.* 1958, **38,** No. 2, 234–40, bibl. 2, illus. [Forage Crops Lab., Saskatoon]

When a mixed ester, a low volatile ester and an alkanolamine formulation of 2,4-D were applied to a crop, the wind-carried spray caused distortion of sunflowers in neighbouring areas. The effects decreased with distance, caused malformations of stems, leaves and heads and resulted in lower seed yields and lower quality. The more volatile mixed ester caused more damage than the other formulations.—M.H.F.

RAPE

347 White, W. J. and Bolton, J. L. **The production of rape in Western Canada.** *Publ. 1021 Canada Dep. Agric.* 1957, pp. 10.

Methods for the growing and harvesting of spring rape grown for seed are described. Suitable soils for, and frost resistance of, the principal types and varieties are noted.—R.B.

348 Singh, Sardar and Sidhu, H. S. **Control of mustard aphid by synthetic insecticides.** *Indian Oilseeds J.* 1958, **2,** No. 3, 24–31, bibl. 8. [Bhupindera Agric. Farm, Rauni (Patiala), Punjab]

The high incidence of the mustard aphid (*Rhopalosiphum pseudobrassicae*) accounts for the low yields of *Brassica napus*, *B. campestris* and *B. juncea* in the Punjab, where rape yields are 354 lb./ac. compared with 1072 lb./ac. in Japan. Aphid mortality obtained on each of the above crops with various insecticides is tabulated, together with the cost of application. Nicotine sulphate was effective but costly. BHC leaves an off-flavour, but where this is not objected to a 0·25% suspension of BHC sprayed at 125 gal./ac. effectively controlled aphids. Of the phosphatic insecticides, parathion (0·02% suspension at 125 gal./ac.) was the cheapest and most effective, but highly toxic [to higher animals]. Malathion (0·0625% emulsion at 125 gal./ac.) was effective, cheap and had a toxicity one-thirtieth that of parathion. The rates given are those which were successful with *B. napus* and *B. campestris*. Higher rates (180 gal./ac.) were required for *B. juncea*.—D.B.

349 Kandeler, R. Die Wirkung von farbigem und weissen Licht auf die Anthocyanbildung bei Cruciferen-Keimlingen. [**The effect of coloured and white light on the formation of anthocyanin in Cruciferae seedlings.**] *Ber. deutsch. bot. Ges.* 1958, **71,** No. 1, 34–44, bibl. 14. [Inst. Angew. Bot., Tech. Univ. Berlin]

The effect of different bands of the spectrum and of white light on anthocyanin formation in 1- to 4-day-old seedlings of *Brassica juncea*, *B. nigra*, *B. oleracea* var. *capitata* f. *rubra*, and *Sinapis alba* was investigated. 4- to 72-hr.-treatment with blue, red, or deep-red bands of the spectrum increased anthocyanin formation to a greater or less degree, and of these bands, deep red increased it most. White light was less effective than the blue to deep-red bands. By inference, green and orange bands have an inhibiting effect on anthocyanin production.—D.B.

GENERAL

350 Savile, A. H. and Wright, W. A. **Notes on Kenya agriculture. 3. Oil seeds, pulses, legumes and root crops.** *E. Afr. agric. J.* 1958, **24,** No. 1, 1–9.

Notes are given on climate, soils, cultivation and harvesting methods and major uses for the following oil crops : groundnut, oil-seed flax, niger seed (*Guizotia abyssinica*), sunflower (*Helianthus annuus*), and sesame (*Sesamum indicum*). Spacings, seed-rates, yields per ac. and time to maturity are tabulated for each crop. [See also Abs. 202 and 302.]—A.M.H.

CROP BOTANY

PHYSIOLOGY

351 Simon, U. Zur Keimfähigkeit alter Samen. [**Viability of old seeds.**] *Z. Acker- u. PflBau* 1958, **106**, No. 1, 108–18, bibl. 6, English summary. [Inst. Acker- u. PflBau, Techn. Hochsch. München, Weihenstephan, Bavaria]

Seed samples (of field crops) dating from the 15th, 19th and 20th centuries were tested for viability. Apart from the 125-yr.-old samples reported in *Fld Crop Abstr.* 11 : 589, the only viable seeds were, as a general rule, those which had been stored for about 10 yr. or less. Rye lost its viability after 8 yr.; about 80% of several varieties of wheat, oats and barley retained viability for about 10 yr. ; and in one instance, oats germinated after 23 yr. storage. Larger-grained cereals e.g. *Zea mays* and *Sorghum vulgare*, retained viability for 12 and 14 yr., respectively. Among Leguminosae, *Lotus corniculatus* germinated after 15 yr. and *Trifolium repens* and *T. pratense* after 10 yr. storage. 50% of 9-yr.-old seed of 2 varieties of *Beta vulgaris*, Teutonica and Altenburger, germinated. It was noticed during the investigation that, in the course of the centuries, the 1000-grain weight of rye increased from 18 g. in the 15th century through 21 g. in the 19th, to 30–35 g. in the 20th century.—D.B.

352 Czaja, A. T. Untersuchungen über die submikroskopische Structur der Zellwände von Parenchymzellen in Stengelorganen und Wurzeln. [**A study of the submicroscopic structure of the walls of parenchyma cells in organs of the shoot and root.**] *Planta* 1958, **51**, No. 3, 329–77, bibl., illus. [Bot. Inst., Tech. Hochsch. Aachen, W. Germany]

The parenchymatous cells of the various organs of a plant appear similar in transverse section, but different in longitudinal section. The cause was investigated in a number of plants which included *Sorghum vulgare*, *Zea mays*, *Brassica napus* f. *napobrassica*, *Beta vulgaris*, [*Glycine*] *hispida*, *Helianthus annuus*, and was attributed to a difference in microscopic texture of the longitudinal and transverse walls.—D.B.

353 Slavík, B. **The influence of water deficit on transpiration.** *Physiol. Plant.* 1958, **11**, No. 3, 524–36, bibl. 14. [Biol. Inst., Czechoslovak Acad. Sci., Prague]

The results are given of experiments with sugar-beet leaves to study the mode in which water deficit affects the intensity of stomatal and cuticular transpiration through its influence on factors other than the regulation of stomatal aperture. The results indicated that the intensity of both cuticular and stomatal transpiration was indirectly related both to the magnitude of the water deficit, and, to an even greater extent, to the rate of increase of water deficit.—P.J.B.

354† Wiegand, C. L. and Lemon, E. R. **A field study of some plant-soil relations in aeration.** *Proc. Soil Sci. Soc. Amer.* 1958, **22**, No. 3, 216–21, bibl. 16. [Texas Agric. Exp. Sta., College Station]

The results are given of preliminary theoretical studies to relate the requirement of plant roots for 0_2 to the capacity of 2 soils to supply 0_2 to the roots. —P.J.B.

355† Horwitz, L. **Some simplified mathematical treatments of translocation in plants.** *Pl. Physiol.* 1958, **33**, No. 2, 81–93, bibl. 21. [State College, Washington]

Since radioactive tracer techniques were introduced, data have accumulated which permit of more quantitative evaluations of the translocation process. The consequences of several translocation theories have been derived mathematically, namely, (a) translocation by continuous " en masse " flow through phloem columns, with irreversible loss of translocate to surrounding tissue, (b) translocation as in (a) but with reversible loss through the walls to surrounding tissues, (c) translocation as in (a) but with a time-variable source of radioactivity in surrounding tissues, (d) osmotic pressure flow theory of translocation, (e) cyclosis-diffusion transport and activated diffusion, and (f) surface flow consequent on surface pressure differentials. Models (a) and (c) predict isotope distributions in conformity with certain experimental data, but models (b) and (f) are less successful. Model (d) was difficult to analyse and model (e) indicates the speeding up of the translocation of solutes by cyclosis and predictions of isotope distributions from this model agree closely with certain experimental results.—M.H.F.

356 Belikov, I. F. [**Redistribution of assimilates in the leaf blade of the soya-bean plant.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1958, **120**, No. 4, 904–6, bibl. 6, illus. [Far-East Filial Acad. Sci., USSR]

[See also *Fld Crop Abstr.* 9 : 111 and 817]. The authors' earlier studies showed that leaf assimilates in *Glycine soja* are not translocated from one leaf to another of similar age but are carried to meristematic tissues (leaves or other organs). Experiments now reported were designed to determine whether the assimilates are circulated within the leaf lamina. By the use of $^{14}CO_2$ and shading part of the leaf, data were obtained which showed that the products of photosynthesis are not circulated within the leaf (even if part of the lamina is perishing under a deficiency of light), but are translocated through the petiole to growing organs. The significance of these facts is discussed in relation to the reduction of illumination on leaf surfaces (by mutual shading or by variation in angle of incidence of the sun's

rays) in a plant stand. It is maintained that crop yields can be augmented by a planting system which ensures illumination of the leaf surface by direct rays of the sun.—M.H.

357 Woolley, J. T. and others. **Movement of chlorine within plants.** *Pl. Physiol.* 1958, **33,** No. 1, 1–7, bibl. 14, illus. [Univ. California, Berkeley]

Retranslocation is defined as the movement of a substance from a terminal location, into which it had moved, to another position in the plant. The distribution of radioactive chlorine, applied overnight to sugar-beet leaves, was studied radioautographically 1 and 8 days after application. The ^{36}Cl was found to have been subject to a continuing redistribution.—M.H.F.

358† Škol'nik, M. Ja. and Markarova, N. A. [**The significance of minor elements in black-earth soils under dry-land conditions and their effect on physiological processes which determine drought- and heat-resistance in plants.**] [Russian] *Trudy Bot. Inst. V. L. Komarova* (*Trudy Inst. bot., Acad. Sci. USSR*) *Ser. 4, Exp. Bot.* 1958, No. 12, 23–73, bibl. 98.

The work includes the following sections: (1) the effect of minor elements on yield and chemical composition of the plants (spring- and winter-wheat, barley, oats, sunflower, and some forage plants); (2) the effect of minor elements on physiological processes which determine drought resistance in plants (including (a) the effect of B on viscosity of the protoplasm and water-holding capacity of leaves of buckwheat and sunflower plants grown in the Stoney Steppe and of barley leaves grown near Leningrad; and (b) the effect of minor elements on transpiration, carbohydrate metabolism and oxidation-reduction processes). The results are discussed in the light of improving crop yields by the use of minor elements in seed treatment and in foliar nutrition. [See also *Fld Crop Abstr.* 9 : 622.]—M.H.

359† Konovalov, I. N. and others. [**Recent data on the physiological nature of the resistance of plants to frost.**] [Russian] *Trudy Bot. Inst. V. L. Komarova* (*Trudy Inst. bot., Acad. Sci., USSR*), *Ser. 4 Exp. Bot.* 1958, No. 12, 299–312, bibl. 34.

[See also *Fld Crop Abstr.* 8 : 1098.] The author's tests were made during 1953–5 to determine the effect of different oxidizing and reducing agents on frost resistance of plants, especially during spring frosts. The plants studied included *Cucumis sativus* and the dent maize hybrid Krasnodarskaja No.149, among others. Methylene blue was the oxidizing agent and hydroquinone the reducing agent. Zinc sulphate (concentration 0·5%) was included because of the effect of micro-elements on the oxidation-reduction characteristics of the plant [e.g. *Fld Crop Abstr.* 5 : 591] ; the leaf extract from *Bergenia crassifolia* was also tested. Methylene blue and hydroquinone in solutions (concentrations 0·02 and 0·05%) were used to soak the seed. The control seed was soaked in water and a variant with dry seed was included. Seed soaking began on 5 April and 70–80% of the seed sprouted by 8–9 April. On 10 April the material was put in culture vessels, some seedlings being kept at 25–28°C. during the day and 15–18°C. during the night, the remainder being kept at 7–12°C. (day) and 0–2°C. (night). On 17 May some of the plants were transplanted into the open and were subjected to frosts (on 3 occasions) of –3, –1·5 and –2°C. during 1954. In 1955 the temperature remained between 2–6°C. (nights) and 7–12°C. (days). Evaluation of frost resistance is based on the number of plants which survived the low temperatures. The data show that 0·03% solution of methylene blue is optimal for maize. There is evidence that : (1) resistance of the plants to frost is closely connected with oxidation-reduction processes, which are enhanced in highly resistant plants ; (2) in maize, treatment of the seed with methylene blue increases the intensity of photosynthesis in the subsequent plants, from 21·5 mg. CO_2 per hour per 1 sq. dc. leaf surface (control) to 38·4 mg. ; (3) under the influence of methylene blue (especially at optimal concentration of 0·05%) the iodine-reduction activity in tissues becomes more stable, being (in 0·005 *N* solution of iodine/100 g. crude weight) 240, 220 and 230 for maize (when sampled on 26 July, 11 Aug. and 8 Sept. respectively) compared with 160, 153 and 340 in the control.—M.H.

360† Ullrich, H. and Heber, U. Über das Denaturieren pflanzlicher Eiweisse durch Ausfrieren und seiue Verhinderung. Ein Beitrag zur Klärung der Frostresistenz bei Pflanzen. [**The denaturation of plant proteins by freezing and its prevention. A contribution towards the understanding of frost resistance in plants.**] *Planta* 1958, 51, No. 4, 399–413, bibl. [Inst. Landw. Bot., Univ. Bonn, W. Germany]

The part played by sugars in preventing frost resistance is considered, and it is postulated that resistance is achieved by the formation of a protein-sugar additive compound. The possibility of deriving frost resistance from other hydroxyl-containing compounds is mentioned.—D.B.

GROWTH AND REPRODUCTION

See also Abs. 522, 527

361† Veen, R. van der. **Plant growth in coloured light.** *Sci. Hort.* 1957–8, **8,** 33–7, illus. [Philips Res. Lab., N. V. Philips' Gloeilampenfabrieken, Eindhoven, Neths.]

362† Canham, A. E. **Practical plant irradiation.** *Sci. Hort.* 1957–8, **8,** 38–43, illus.

[Elect. Res. Ass., E.R.A. Fld Stn, Shinfield Green, Engl.]

363† Junges, W. Die Wirkung von Tageslänge und Lichtintensität in der Präthermophase bienner Pflanzen. [**The action of daylength and light intensity in the pre-thermophase of biennial plants.**] *Ber. deutsch. bot. Ges.* 1958, **71**, No. 5, 197–204, bibl. 18. [Inst. Gartenbau, Dresden-Pillnitz, E. Germany]

364† Krug, H. Photoperiodische Forschung und praktischer Pflanzenbau. [**Photoperiodic research and crop cultivation.**] *Beitr. Biol. Pfl.* 1958, **34**, No. 2, 267–91, bibl. 47, illus.

This review discusses the basic principles of photoperiodic reactions of plants and the relationship of photoperiodism to other plant-physiological processes. The application of photoperiodism to crop cultivation is considered from the standpoint of changing daylength throughout the year and different daylengths in different latitudes. Photoperiodic induction of seed and seed tubers is briefly mentioned.—D.B.

365 Aslyng, H. C. and Kristensen, K. J. **Investigations on the water balance in Danish agriculture.** *Årsskr. K. vet. LandbHøjsk.* 1958, 64–100, bibl. 27.

[For an account of work carried out before 1953, see *Fld Crop Abstr.* 7 : 678.] The present investigations deal with the water consumption of herbage and field crops grown in lysimeters receiving different levels of water supply, and in the field at 2 locations near Copenhagen. Crops used included barley, oats and fodder-beet. The effect of N treatments and different soil conditions on the root development, water balance and yield of oats, barley and fodder-beet was studied. The results indicated the importance of good soil aeration and adequate N supply for promoting good root development and drought resistance. Spring and summer cultivations increased evaporation from the soil and it was concluded that cultivations should be kept to a minimum.—P.J.B.

GROWTH SUBSTANCES

See also Abs. 522

366† Persson, A. R. Vekststoffet gibberellin. [**The growth substance gibberellin.**] *Tidsskr. Norsk Landbr.* 1958, **65**, No. 8, 202–18, bibl. 15, illus., English summary.

The effects of GA on plants are itemized and reviewed.—P.J.B.

367† Morel, G. Nouveaux régulateurs de croissance. [**New growth regulators.**] *Ann. agron., Paris* 1957, **8**, No. 6, 167–89, bibl. 75, illus. [Sta. Cent. Physiol. Vég., Versailles, France]

This review article is concerned with kinetin and gibberellin.—E.B.O.

368† Verdejo, G. Derivados metabólicos del *Gibberella fujikuroi.* [**Metabolic derivatives of *G. fujikuroi.***] *Arch. Inst. Aclim.* 1957, **6**, 9–159, bibl. at end of chapters, illus. [Inst. Aclim., Almería, Spain]

This is mainly a review article; also an account of original research [see *Herb. Abstr.* 28 : 709.] The main aspects considered are the physiological effects of gibberellins and gibberellic acid on plants. —E.B.O.

369† Kuse, G. **Necessity of auxin for the growth effect of gibberellin.** *Bot. Mag. Tokyo* 1958, **71**, No. 838, 151–9, bibl. 18, illus. [Kyoto Univ., Japan]

Using *Ipomoea batatas* as experimental material, it was demonstrated that GA promoted petiole elongation only in the presence of auxin whether this was supplied internally by the leaf blade or externally by means of IAA. TIBA, applied to the petiole, prevented the downward movement of the GA- and IAA-induced elongation effect at points below the site of its application.—D.B.

370 Lockhart, J. A. **The response of various species of higher plants to light and gibberellic acid.** *Physiol. Plant.* 1958, **11**, No. 3, 478-86, bibl. 14. [Kerckhoff Biol. Labs, California Inst. Technol., Pasadena]

The studies reported were carried out to determine whether the capacity of GA to reverse the effect of certain light regimes in inhibiting internode elongation was a phenomenon common to a range of different spp. Plants tested included peas and sunflowers. The results indicated that GA was able to promote the growth of all spp. under light regimes which depressed growth, though, in some cases, restoration of growth by GA was not complete. The inhibition of stem elongation caused by ultra-violet radiation was not affected by treatment with GA or IAA.—P.J.B.

371† Nickell, L. G. **Production of gibberellin-like substances by plant tissue cultures.** *Science* 1958, **128**, No. 3315, 88–9, bibl. 12. [Biochem. Res. Dev. Div., Chas. Pfizer and Co,, Inc., Brooklyn, New York]

A preliminary report is made of the results of a survey of plant-tissue cultures as sources of gibberellin-like substances. Acetone-water extracts were made from 20 g. fresh weight of cultured tissue from each of 6 plant spp. ; each sample was concentrated to 5 ml. and sprayed on to 5 dwarf pea plants. The effects of the treatments on growth were measured 3, 5 and 7 days after application and compared with the effects of GA at 0·5 ppm. Weak, positive growth-effects were obtained with root, root-virus tumour and stem-virus tumour tissues of *Melilotus officinalis.* Strong positive growth-effects, though not as pronounced as those caused by GA, were obtained with crown-gall petiole tissue of *Helianthus annuus.* Leaf tissue of the monocotyledon

Agave toumeyana gave a good positive growth response. Tissue culture media, and several auxins, purines, antibiotics, organic and amino-acids, and several types of chelating agent had little or no effect on pea growth. Some of the tissue cultures used in the experiment had been maintained on synthetic media for a number of years.—R.B.

372† Gouny, P. Incidences de la nutrition azotée uréique sur la biochimie du végétal. [**Effect of ureic nitrogen nutrition on plant biochemistry.**] *Ann. agron., Paris* 1957, **8**, No. 6, 155–66, bibl. 8. [Sta. Agron. et. Physiol. Vég., Antibes, France]

In trials with maize, peas and lupins, N nutrition exclusively in the form of urea resulted in an insufficient development of the plants. Results were better with peas than with the other species, and with nutritive solutions applied to the roots than as sprays to the leaves.—E.B.O.

NUTRITION

See also Abs. 529

373† Bussler, W. Manganmangelsymptome bei höheren Pflanzen. [**Manganese-deficiency symptoms in higher plants.**] Manganvergiftung bei höheren Pflanzen. [**Manganese poisoning in higher plants.**] *Z. PflErnähr. Düng.* 1958, **81**, No. 3, 225–42, bibl. 21, illus., and 256–65, bibl. 14, illus. [Techn. Univ., Berlin]

The morphological and anatomical symptoms of Mn-deficiency were studied in several plants which included peas, vetch, sunflower, oats, and maize. The object was to find a symptom typical for all species. This was a chlorosis spot (or a necrosis spot developed from the former) in the region of the finest subdivisions of the veins of a young leaf. This symptom is not masked by deficiencies of other nutrients. Whereas the symptoms of Mn-deficiency occur first in the assimilating tissues of young leaves, the symptoms of excess Mn occur in the old and non-assimilating tissues e.g. in the epidermis near veins of the first order and the conducting tissue.—D.B.

374† Henkens, C. H. Het belang van het onderzoek op sporenelementen bezien uit een landbouwkundig oogpunt. [**The agricultural importance of trace-element research.**] *Het Chemisch Bodemvruchtbaarheidsonderzoek*, pp. 16, bibl. 23, illus.

TECHNIQUES AND APPARATUS

375 Waris, H. **Simple devices for aseptic culture of seed plants.** *Physiol. Plant.* 1958, **11**, No. 3, 627–30, illus. [Bot. Inst., Univ. Helsinki]

The devices described are as follows : (1) For plants to be grown wholly or partly submerged. Erlenmeyer flasks are fitted with an S-shaped tube on the side. The seeds or other plant material are placed at the bottom of the S-bend. H_2O_2 is introduced to sterilize the plant material and subsequently allowed to drain out of the S-tube by inclining it and allowing liquid to leak out past a loosened stopper. The flask is then inclined again to allow nutrient solution to flush the plant material into the main body of the flask. (2) For plants forming aerial shoots. A cross-tube is attached by a short length of tubing to an Erlenmeyer flask and fitted with a removable S-tube similar to that described for (1). The seed (peas and beans, primarily) is sterilized by H_2O_2 in the same way, before being allowed to fall through the cross-tube into the small length of tubing connecting it to the flask, where it is held by a constriction just above the level of the nutrient solution. The seed grows and as the shoot moves up through the cross-tube, cotton wool plugs are pushed in from each end to exclude ambient air and the removable S-tube is then taken away, permitting the shoot to grow into the open air.—P.J.B.

376† Kolk, H. Sundhetsundersökningar av utsädesvaror. Några jämförelser och reflexioner. **Investigation of health conditions in seeds. Comparisons and comments.** *Medd. Frökontrollanst., Stockh.* 1958, No. 33, 60–71, bibl. 26, English summary.

Different methods for determining the presence of pathogens on seeds, including the Ulster and East Craigs procedures and the Wageningen filter-paper method, are reviewed and compared. Different laboratory techniques for determining the presence of individual pathogens in seeds are also considered. The author concludes that the Ulster method offers many advantages as a practical technique and that more attention should be paid in Sweden to the phytopathological investigation of seeds.—P.J.B.

377† Nagai, M. **Studies on germination of seed under periodic temperature change. 1. Experimental apparatus and some results.** [*Japanese*] *Bull. Fac. Agric. Shizuoka Univ.* 1957, No. 7, 34–7, bibl. 6, illus., English summary.

A newly devised laboratory thermostat which controls temperatures so as to represent outdoor diurnal variations is described. Rice was included in the germination trials in this apparatus. F. Eng. s.—D.B.

378 Eliasson, L. **The inhibitory effect of oxygen on the growth of wheat roots.** *Physiol. Plant.* 1958, **11**, No. 3, 572–84, bibl. 33. [Pl. Physiol. Inst., Roy. Agric. Coll., Uppsala, Sweden]

A technique for growing roots under controlled conditions in glass tubes with a diameter of *c.* 1 mm. is described.—P.J.B.

379 Box, J. E. and Lemon, E. R. **Preliminary field investigations of electrical resistance-moisture stress relations in cotton and grain sorghum plants.** *Proc. Soil Sci. Soc. Amer.* 1958, **22,** No. 3, 193–6, bibl. 17, illus. [Texas Agric. Exp. Sta., College Station]

Measurements were made of the electrical resistance of the stems of cotton and sorghum plants by means of two needle electrodes, 2·5 cm. apart, inserted above the first cotyledonary node in cotton and in the first internode above the crown in sorghum plants. The effect of different irrigation intervals over a period of 7 weeks on stem resistance was studied. Resistance readings were taken at 0800 or 1400 hr. With sorghum, there was no clear relationship between moisture stress and electrical resistance. In cotton, increasing moisture stress resulted in closely correlated increases in electrical resistance; after irrigation, resistance values dropped to a basic level within 4 hr. This basic level of resistance was not affected by the physiological age of the plants. The coefficient of variation between resistance readings was lower (10%) at 0800 than at 1400 (20%). It was considered that this technique was of promise for indicating moisture stress in certain spp., though further studies were required to determine its limitations.—P.J.B.

380 Downs, R. J. and others. **Comparison of incandescent and fluorescent lamps for lengthening photoperiods.** *Proc. Amer. Soc. hort. Sci.* 1958, **71,** 568–78, bibl. 16, illus. [U.S. Dep. Agric., Beltsville, Maryland]

The responses of various long-day, short-day and indeterminate plants to supplemental light obtained from unfiltered incandescent or florescent lamps were studied. All plants received a basic 8-hr. period of natural light, supplemented by 0, 4, or 8 hr. of incandescent or fluorescent light. Biloxi and Agate soyabeans produced taller individuals under incandescent than under fluorescent light. In plants in which stem elongation is an integral part of the flowering process, e.g. Siberian millet (*Setaria italica*), barley (*Hordeum vulgare* var. Colsess I) and wheat (*Triticum compactum* var. Little Club), flowering occurred sooner under incandescent than under fluorescent supplemental light. The accelerated stem elongation caused by incandescent supplemental light is due to the far-red component of the radiation emitted by the source, which is lacking in the emission of the fluorescent lamp. F. s.—A.M.H.

381† Slatyer, R. O. **The measurement of diffusion pressure deficit in plants by a method of vapour equilibration.** *Aust. J. biol. Sci.* 1958, **11,** No. 3, 349–65, bibl. 20, illus. [Div. Ld Res. and Reg. Survey, CSIRO, Canberra]

A method for measuring diffusion pressure deficit (DPD) in plants is described. It differs from the standard floating methods in that it involves the equilibration of tissues in vapour of known water potential rather than in solutions of known osmotic potential. The technique involves the use of micro-desiccators in which disks of leaf tissue are arranged on small grids 5 mm. above the surface of salt solutions of known water potential. Equilibration takes place in a constant-temperature water bath with the temperature controlled to $\pm$ 0·001°C. In comparison with the standard floating methods, the vapour technique has advantages in precision and reproducibility at all degrees of water stress above a few atmospheres DPD. At these low stress levels, both methods appear satisfactory, but the floating method has greater errors as turgor pressure falls. F.s. —A.M.H.

382† Falk, H. Ein Beitrag zur Methode der quantitativen Chlorophyllbestimmung. [**Quantitative determination of chlorophyll.**] *Planta* 1958, **51,** No. 1, 49–62, bibl., illus. [Bot. Inst., Univ. Heidelberg]

383† Watkinson, J. H. **The spectrophotometric determination of molybdenum, tungsten, and vanadium in soils and plants. Part 1. In soils.** *N.Z. J. Sci.* 1958, **1,** No. 2, 201–19, bibl. 28. [Rukuhia Soil Res. Sta., Hamilton, N.Z.]

384† Mitchell, R. L. and Scott, R. D. **The application of spectrochemical methods to agricultural problems.** *Appl. Spectroscopy* 1957, **11,** No. 1, 6–12, bibl. 22. [Macaulay Inst. Soil Res., Aberdeen]

A method for the determination of microquantities of trace elements in soils and plant material by means of arc spectrometry is described.—R.B.

385† Tanner, C. B. **Soil thermometer giving the average temperature of several locations in a single reading.** *Agron. J.* 1958, **50,** No. 7, 384–7, bibl. 6, illus. [Dep. Soils, Univ. Wisconsin, Madison, Wis.]

386† Kok, B. Enige voorbeelden van het gebruik van tracers in het fotosynthese-onderzoek. [**Some examples of the use of tracers in the study of photosynthesis.**] *Landbouwk. Tijdschr., Wageningen* 1958, **70,** Suppl., 334–43, bibl. 7. [Landbouwhogeschool, Wageningen]

387† Wybenga, J. M. Autoradiografie. [**Autoradiography.**] *Landbouwk. Tijdschr., Wageningen* 1958, **70,** 313–26, [Suppl.], bibl. 3. [Lab. Fert. Res., Wageningen]

Techniques developed for the macroautoradiography of plants are described. The results of experiments on the use of autoradiography for studying the distribution and transport of ^{22}Na in plants are reviewed.—P.J.B.

388† U.S. Department of Commerce, Nat-

IONAL BUREAU OF STANDARDS. **Safe handling of radioactive isotopes.** *Handbk 32 Nat. Bur. Standards* 1949, pp. 30, illus. [Received June, 1958]

RADIOBIOLOGY

See also Abs. 528

389† WASSINK, E. C. and others. **A bibliographical study on uptake and accumulation of nutrient elements by plants in view of the possible occurrence of radioactive isotopes of these elements among the waste of nuclear reactors.** *Meded. LandbHogesch., Wageningen* 1956, **56**, No. 16, pp. 52, bibl. 174. [Received March, 1958]

This publication reviews the literature on the accumulation of radioactive elements in plants. There is a general account of the composition of plants and their uptake of different elements, followed by an itemized review of the accumulation in soil and plants of 16 elements, the isotopes of which may occur in waste waters from nuclear reactors.—P.J.B.

390† RUSSELL, R. S. **Deposition of strontium-90 and its content in vegetation and in human diet in the United Kingdom.** *Nature, Lond.* 1958, **182**, No. 4639, 834–9, bibl. 20. [ARC Radiobiol. Lab., Grove, Wantage, Berks]

Aspects discussed include : world-wide fall-out, the present mechanism of entry of ^{90}S into vegetation ; future relationship between the rate of world-wide fall-out and the ^{90}S content of vegetation and milk in the UK ; and comparison of the rates of entry of ^{90}S into plants under different climatic and agricultural conditions.—M.H.

391† RUSSELL, R. S. and SQUIRE, H. M. **The absorption and distribution of strontium in plants. 1. Preliminary studies in water culture.** *J. exp. Bot.*, 1958, **9**, No. 26, 262–76, bibl. 13. [Dep. Agric., Univ. Oxford]

392 THORNE, Gillian N. **Factors affecting uptake of radioactive phosphorus by leaves and its translocation to other parts of the plant.** *Ann. Bot., Lond.* 1958, **22**, No. 87, 381–98, bibl. 25. [Rothamsted Exp. Sta., Harpenden, Herts]

The rate of uptake of ^{32}P from labelled NaH_2PO_4 solutions sprayed on to one leaf of *Brassica napus* or *Phaseolus vulgaris* was rapid during the first few hours and fell to zero after 4 days. ^{32}P was detected in the root after 3 hr. and continued to move out of the treated leaf for at least 6 days after application. A larger fraction of the applied ^{32}P was absorbed from repeated than from a single spraying. Swedes absorbed more ^{32}P from a single application to the lower surface than to the upper surface of the leaf. Doubling the concentration of the spray caused a small increase in the percentage of applied ^{32}P that was absorbed. Absorption by French-bean leaves decreased slightly when the area sprayed with a constant amount of ^{32}P was doubled, and decreased with increasing age of leaf. Increasing the phosphorus supply to the roots of swedes affected neither the initial rate nor the total amount of ^{32}P uptake by the leaves but decreased the quantity of ^{32}P that was translocated out of the treated leaf. Increasing the relative humidity of the air around the plants also increased ^{32}P uptake. Shading usually decreased uptake and always decreased translocation. F. S.—M.H.

WEEDS AND WEED CONTROL

Where weeds are specific to a crop, see under the crop concerned. See also Abs. 532.

393† CUMMING, B. G. and HAY, J. R. **Light and dormancy in wild oats (*Avena fatua* L.).** *Nature, Lond.* 1958, **182**, No. 4635, 609–10, bibl. 5. [Sci. Serv., (B.G.C.) and Exp. Fms Serv., Ottawa, (J.R.H.)]

The experiments reported show that, under artificial conditions, white, blue and infra-red radiations inhibit germination of partially dormant wild oats. Under natural conditions, daylight inhibits the germination of partially dormant wild oats on the soil surface ; cultivations that bury such seed may therefore favour increased germination. Recent field tests have shown that, when autumn tillage was practised, wild oats germinated the following spring earlier and in greater numbers. Ext.—M.H.

394† MÜHLETHALER, P. Die Quecke (*Agropyron repens*) und ihre Bekämpfung. [***A. repens* and its control.**] *Schweiz. Landw. MH.* 1958, **36**, No. 6, 220–2, bibl. 3.

The control of *A. repens* by cultivation measures is based on (1) disturbing the rhizomes by surface cultivation to allow them to dry out during summer days ; (2) burying and suffocating the roots by deep ploughing in winter ; (3) depriving the new spring growth of light by growing crops which cast deep shadow, e.g. potato (Ackersegen), vetch or rye, all well manured. For chemical control, TCA is used in Switzerland. [No mention is made of dalapon.—Ed.] [See *Fld Crop Abstr.* 11 : 362, 703, 805, 1242, 1243 and 1449.]—D.B.

395 SAIDAK, W. J. **Studies with EPTC for nutgrass control.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 196–9.

In glasshouse trials, rates of 1–20 lb. EPTC/ac. were applied to *Cyperus esculentus* at different growth

stages. Treatment with 10 lb. EPTC/ac. at growth stages ranging from emergence to 2 in. high gave complete control. In field trials in New York State, EPTC treatments made to potatoes were ineffective for controlling nutgrass, which was thought to be due to the incorporation of the herbicide into the surface layer of soil. In trials in which sweet-corn and beans [*Phaseolus* sp.] were used as test crops, the total rate of EPTC applied was more important for weed control than the timing. Rates of EPTC above 10 lb./ac. damaged sweet-corn, but not the beans. EPTC at 15 lb./ac. gave significantly better nutgrass control than did lower rates and it was concluded that this herbicide showed promise for practical nutgrass control. EPTC was more effective in the moister parts of central New York State, than in the drier western parts.—P.J.B.

396 Veatch, C. **Control of nutgrass (*Cyperus esculentus*) in corn with DNBP.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 200.

In trials in W. Virginia, nutgrass in maize was effectively controlled by applying post-emergence sprays of dinoseb at rates of 3 or 4 lb./ac. in 28 gal. spray.—P.J.B.

397 Hill, G. D., Jr. **Herbicide studies : 1. Herbicides and adjuvants on Canada thistle (*Cirsium arvense* Tourn.).** *Diss. Abstr.* 1958, **18**, No. 4, 1179–80. [Ohio State Univ., Columbus]

Various formulations of 2,4-D, 2,4,5-T, TCA, MCPA, MH and $NaClO_3$ were used with or without adjuvants as pre-emergence and post-emergence herbicides on a uniform stand of *Cirsium arvense* and *Agropyron repens*. No single post-emergence application of herbicide gave complete control of *C. arvense*. MCPA and 2,4-D gave the best control. Treatment in May when thistles were 10–14 in. tall gave the most effective stand reduction. Translocation of 2,4-D to the roots in May at the 10–14 in. stage, as measured by depth of root kill, was definitely greater when small repeated doses were used. Heavy applications of herbicides killed the thistle tops so quickly that little downward translocation occurred. No increase in thistle control resulted from the use of adjuvants. $NaClO_3$ at 500 lb./ac. suppressed thistle growth for 12 months, but without re-treatment the thistles recovered. TCA at 200 lb./ac. caused no visible injury to thistles.—R.B.

398 Santelmann, P. W. and Meade, J. A. **Johnson grass control with dowpon in Maryland.** *Down to Earth* 1958, **13**, No. 4, 10–11, illus.

Repeated sprayings of summer fallows with sodium 2,2,-dichloropropionate controlled *Sorghum halepense*. A single spring treatment before ploughing enabled improved crops of soyabeans and maize to be harvested.—M.H.F.

399† Forster, R. Dalapon, no combate ao sapé (*Imperata brasiliensis* Trin.). [**Dalapon for the control of *Imperata brasiliensis*.**] *Bragantia* 1957, **16**, Note 1, I–III, English summary.

Dalapon 68% solution was sprayed at the rate of 0·25, 0·50, 0·75 and 1 g. active principle per sq. m. on plots infested by *Imperata brasiliensis*. All treatments reduced the infestation markedly.—E.B.O.

400† Parsons, W. T. **Golden thistle. A weed of limited distribution.** *J. Dep. Agric. Vict.* 1958, **56**, No. 9, 591–7, illus.

Golden thistle (*Scolymus hispanicus*) can be controlled by spot-spraying at the late-rosette stage with 0·2% 2,4-D ester or MCPA. For boom-spraying, one application of 2 lb. a.e. 2,4-D ester in 30 gal. water per ac., or applications of 1 lb. a.e./ac. in 2 successive years, are recommended, the latter giving more permanent control.—A.M.H.

401† O'Neil, J. M. **Three weeds which are easily confused. Star, saffron and soldier thistles.** *J. Dep. Agric. S. Aust.* 1958, **61**, No. 12, 558–60, illus.

Star thistle (*Centaurea calcitrapa*), saffron thistle (*Carthamus lanatus*) and soldier thistle (*Picnomon acarna*) can be controlled in S. Australia by competition from vigorous pasture spp., particularly *Phalaris*, or by spraying with 0·75–1·0 lb. a.e. 2,4-D or MCPA/ac., for *C. calcatrapa* and *C. lanatus*, or 2 lb. a.e. 2,4-D/ac. for *P. acarna* ; the higher rates given are harmful to cereal crops.—A.M.H.

402† Parsons, W. T. **Cape tulip. A poisonous, noxious weed.** *J. Dep. Agric. Vict.* 1958, **56**, No. 6, 377–84, illus.

Measures recommended for control of Cape tulip (*Homeria breyniana* and *H. miniata*) are : cultivation slightly deeper than the corm depth (3–6 in.) in 3–4 successive years, at the stage when the old corm has shrivelled and the new one has only partially developed (usually June–July) ; and spraying with 2,4-D ester at 2 lb. a.e./ac. in the 1st yr. and 1 lb. a.e./ac. in the 2nd, or spot spraying with 0·2% a.e. 2,4-D ester. For *H. miniata* spraying is effective from the corm transition stage until flowering, while for *H. breyniana* the early-flowering stage is best. Before spraying, sprouting of as many corms as possible should be stimulated by the use of heat (leaving the soil surface exposed during the summer, or burning-over the area) or by autumn cultivation.—A.M.H.

403† East African Farmer and Planter. **Mexican marigold (kakiebos, *Tagetes minuta*).** *E. Afr. Fmr and Planter* 1958, **2**, No. 11, 16–17.

T. minuta can be controlled by spraying at the seedling stage with MCPA, MCPB, 2,4-D or 2,4-DB at 1–4 pt./10–21 gal. water/ac., depending

on the proprietary product used. Pre-emergence spraying is also effective. Annual spraying is necessary to kill plants arising from seed brought to the surface by cultivation.—A.M.H.

404† Kirkpatrick, H. **Eradication and control of water hyacinth. Results of a campaign in the Belgian Congo in 1955-57.** *World Crops* 1958, **10**, No. 8, 286–8, bibl. 3, illus.

Water hyacinth (*Eichhornia crassipes*) was successfully eradicated from large areas of the Congo in 1955–7 by spraying with 2,4-D (amine) at 8 lb. a.e./ac., (100 gal. of 1% solution per ac.). A 0·7% solution was also effective. A follow-up spray was applied 2 weeks after the first.—A.M.H.

405† Scientific Council for Africa South of the Sahara. **Symposium on *Eichhornia crassipes*.** *Publ. 27 Comm. Tech. Co-op. Afr. S. of Sahara*, Léopoldville, 1957, pp. 33.

Progress made in eradicating *E. crassipes* from the Congo, Itimbiri, Kasai, Ubangui and Sanga rivers is noted. Among recommendations made were : proper maintenance of cleared areas ; research to find more effective and economical means of destruction, and the establishment of a bureau to carry out investigations and disseminate information ; immediate destruction of new foci of infestation ; inspection of shipping on reaching uninfested water ; use of 2,4-D of low-volatility so as to minimize crop damage ; suspension of spraying in cotton-growing areas from 2 months before sowing until harvest.—A.M.H.

406 Younger, R. R. **A preliminary report on controlling aquatic vegetation in New Jersey with kuron.** *Down to Earth* 1958, **13**, No. 4, 2–3.

An experiment on the practicability of using a trichlorophenoxy-proprionic ester for controlling aquatic weeds in ponds is described.—M.H.F.

407 Department of Agriculture, Cyprus. **Weed control.** *Rep. Dep. Agric. Cyprus 1957*, 1958, p. 49.

Total kill of the aerial part of the perennial weed *Zizyphus lotus* was obtained during a whole growing season by treatment with 2,4,5-T.—E.B.O.

408† May and Baker, Ltd. **Scrub control by chemical means.** *World Crops* 1958, **10**, No. 8, 289–90, illus.

Three methods are described for the application of a 2 : 1 mixture of 2,4-D and 2,4,5-T esters (total of 7 lb. a.e./gal., used at 2—3 pt./100 gal. water) for control of scrub in Great Britain.—A.M.H.

409† Esteves-de-Sousa, A. **Preliminary experiments with phytocides to control stump growth and thorny bush thickets in areas infested with *Glossina austeni*.** *Internat. Sci. Cttee Trypanosomiasis Res., 6th Meeting, Salisbury 1956*, pp. 163–72, bibl. 13, illus. [Chinhanguanine, Lourenço Marques]

When applied to dormant plants during the dry season (July), Geigy Brush Killer No. 22 (27·2% butyl ester of 2,4-D and 26·5% butyl ester of 2,4,5-T, equivalent to 21·7% active 2,4-D and 21·7% active 2,4,5-T), used at 1 gal./50 gal. diesel oil [application rate not stated], delayed flowering and regrowth of an *Acacia/Dichrostachys* thicket. It also killed *Agave* bushes in one area of heterogeneous shrub and small-tree vegetation, but other spp. recovered slowly. In another area, all climbing succulents were killed within 2 months of treatment and spp. of *Adenium*, *Pachypodium*, *Alca* and *Sanseviera* wilted and decayed. Spp. of Combretaceae recovered quickly. When used for stump treatment (1 part herbicide : 9 parts diesel oil) it prevented regrowth of *Olea* and *Xylopia* spp. and decreased that of *Albizzia* and *Spirostachys*. Application of the herbicide when the plants were active (December) killed dense *Acacia/Dichrostachys nutans* thicket in 4 months and most members of a dense heterogeneous association of some 22 spp. by the end of May, thus facilitating burning in June.—A.M.H.

410 Hoffmann, G. M. Starkes Auftreten des Hanfwürgers (*Orobanche ramosa* L.) im Havelländischen Luch. [**Heavy infestation of broom-rape (*O. ramosa*) in the Havelland marsh.**] *Dtsch. Landw.* 1958, **9**, No. 5, 221–2, bibl. 2, illus. [Inst. f. Phytopathologie, Aschersleben, E. Germany]

There has been during the last few years, and especially in 1957, a great increase in *O. ramosa* in the Havelland marsh [Brandenburg], one of the most important areas in E. Germany for the cultivation of *Cannabis sativa*. The infestation is attributed to the repeated cultivation of *C. sativa* on the same land and to insufficient care in its seed production and cleaning. The measures recommended for control include : growing a crop which does not serve as a host to *O. ramosa* and which hinders its early growth and seed production ; introduction of long-course rotations, bearing in mind that the seed retains its viability for 6–8 yr. ; official testing of seed of *C. sativa* for seed of *O. ramosa*.—D.B.

411† Gostinchar, J. Sensibilidad de las malas hierbas, en los sembrados de invierno, a los herbicidas selectivos, a base de 2,4-D y 2,4,5-T. [**Susceptibility of weeds in winter crops to selective herbicides based on 2,4-D and 2,4,5-T.**] *Agricultura, Madr.* 1958, **27**, No. 311, 125–30, bibl. 8, illus.

Information is given on weeds (grouped by families) of winter crops in Spain, especially in Seville province.—E.B.O.

412† Taylor, R. L. and others. **Weeds in**

Alaska. *Bull. 600 Univ. Alaska Agric. Ext. Serv.* 1958, pp. 32, illus.

Illustrated descriptions of 22 common weeds of Alaska are given, and suitable chemical control for 40 weed spp. is described.—R.B.

413 Börner, H. Experimentelle Untersuchungen zum Problem der gegenseitigen Beeinflussung von Kulturpflanzen und Unkräutern. [**Experiments to investigate the problem of the interaction of crop plants and weeds.**] *Biol. ZBl.* 1958, **77**, No. 3, 310–28, bibl. 36, illus. [Inst. PflSchutz, Landw. Hochsch., Stuttgart-Hohenheim, W. Germany]

The experiments demonstrated the slightly stimulating effect of *Sinapis arvensis* on *Avena sativa* and the markedly inhibiting effect of *A. sativa* on *S. arvensis*. The experiments make a contribution towards discovering the cause of this phenomenon. It could not be attributed to competition for nutrients nor to root excretion, but the evidence suggests that the cause can be narrowed down to plant functions in the root region.—D.B.

414† Elliott, J. G. and Fryer, J. D. **Dalapon for the control of grass weeds.** *Agriculture, Lond.* 1958, **45**, No. 3, 119–24. [Unit Exp. Agron., Oxford Univ.]

An account is given of progress in the use of dalapon. Preliminary experiments suggest that about 8 lb. dalapon (Na salt) per ac. is sufficient for killing 90% or more of plants of *Avena fatua* when these are sprayed between the 2-leaf and fully-tillered stages. Smaller doses can bring about a useful inhibition of growth. For *Agropyron repens* the minimum effective dose may vary between 5 and 40 lb. per ac. according to the conditions of the land and the subsequent cultivation. The most desirable method of application from the farmers' standpoint is the treatment of cereal stubble in autumn because this method causes no check or modification in the rotation. The effect on subsequent crops was studied. Dalapon applied at 10–15 lb. per ac. persists in the soil at a concentration sufficient to damage crops sown within 6 weeks of spraying. The effect persists longer in warm, moist weather than during cold, dry periods. After treatment in spring, kale is a good first crop because of its smothering effect on any couch grass which may have survived the treatment. A list is given of crops susceptible to 5 lb. and to 10 lb. dalapon (a.e.) per ac. and of non-gramineous weeds resistant to 10 lb. per ac. Spring barley is very susceptible to injury. Lucerne and white clover appear to offer most hope for the selective use of dalapon. Other uses are : control of bracken and of emergent aquatic plants from ditches ; clearing unwanted vegetation from borders of fields ; destroying old swards, instead of ploughing them in.—D.B.

415 Feddema, L. **The influence of depth of placement on herbicidal activity of monuron and simazin.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 41–4. [Cornell Univ., Ithaca, New York]

The trials reported were carried out to investigate the relationship between the type of root system possessed by *Chenopodium album*, *Amaranthus retroflexus*, *Portulaca oleracea* and *Taraxacum* spp. and 3 horticultural crops, including red beet, and the effect of monuron. Monuron at 0·5 and 1 lb. a.i./ac. and simazin at 2 lb. a.i./ac. were placed at depths of 0, 4, 8 and 12 in. in the soil. On plots treated with monuron, surface applications, alone, permitted plant growth from seed and then only in the case of red beet and *C. album*. This was attributed to the fact that the seeds of these spp. were below the soil surface when treatments were applied and to the rapid development of a taproot into soil containing no herbicide. Surface applications of simazin killed all spp. ; where this herbicide was placed at different depths, only *A. retroflexus* was able to grow. This was attributed to the small proportion of the total root system of this spp. at any given zone of herbicidal placement.—P.J.B.

416 Sweet, R. D. and others. **Longevity of several herbicides in soils.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 17–24. [Cornell Univ., Ithaca, New York]

In field trials on a poorly-drained, silt-loam soil, simazin at 5 and 10 lb./ac. showed noticeable residual action, persisting for two years. In trials on well-drained, stony silt-loam soil, two TCB formulations showed appreciable residual effect on maize. In glasshouse trials with dalapon, the results showed that it was not safe to sow sensitive crops (oats and maize were used as test crops) before 5 weeks after soil treatment. In observations in the field on sandy loam, of a number of TCB formulations used, the Na salt of a mixture containing a relatively high content of the 2, 3, 6 isomer, applied at 1, 2 or 4 lb./ac., showed considerable residual activity.—P.J.B.

417† Wensley, G. L. **Variable dosage spraying.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 1–7. [Fisons Pest Control, Ltd., Chesterford Park Res. Sta., England]

A brief description is given of the mode of operation and use of the Chesterford logarithmic sprayer, as used for applying herbicides.—P.J.B.

418† Selleck, G. W. **Note on the place of a logarithmic sprayer in testing herbicides for weed control.** *Canad. J. Pl. Sci.* 1958, **38**, No. 2, 270–3, bibl. 3, illus. [Univ. Saskatchewan, Saskatoon]

419† Blackman, G. E. and others. **Studies in**

the principles of phytotoxicity. 5. Interrelationships between specific differences in spray retention and selective toxicity. *J. exp. Bot.* 1958, **9**, No. 26, 175–205, bibl. 15. [Dep. Agric., Univ. Oxford]

420† HELGESON, E. A. **Methods of weed control.** *Agric. Studies 36 FAO* 1957, pp. 189, bibl. 73, illus.

The object of this publication is to provide a ready reference on weed control for those without access to the wide range of literature on the subject. The field covered includes cultural and mechanical, as well as chemical, means of weed control, emphasis being laid on practical aspects. The various herbicides are dealt with separately. The subjects of other chapters are : equipment for weed control ; control of aquatic and ditchbank weeds ; control of woody plants ; control of weeds in grassland and turf ; weed control in field crops. The control of 41 important weeds is described separately. A 26-page table shows the reaction of plant species (weeds and crops) to treatment with 2,4-D, 2,4,5-T, MCPA, DNC and dinoseb.—E.B.O.

SURVEYS AND LAND USE

SURVEYS

See also Abs. 519

421 MALATO-BELIZ, J. Breve notícia da III Excursão Internacional de Fitosociologia (Pavia-Itália). [**Brief information on the Third International Excursion of Phytosociology (Pavia, Italy).**] *Agros, Lisboa* 1958, **41**, No. 2, 117–52, bibl. 7, illus. [Esta. Melhor. Plantas, Elvas, Portugal]

The information given includes notes on agriculture in Pavia Province, where the principal crops are wheat, rice, maize and forage crops, and phytosociological studies of the vegetation of rice- and wheat-fields.—E.B.O.

422 TERRE MAROCAINE. La mise en valeur agricole de la vallée du Souss. [**The agricultural improvement of the Souss valley (Southern Morocco).**] *Terre maroc.* 1958, **32**, No. 340, 109–16, No. 341, 163–9, and No. 342, 205–7, bibl. 6.

Information is given on the Souss Plain, in particular its climate, agriculture and water resources. Data are given of cereal production (barley, soft wheat, durum wheat and maize). Cotton and forage crops are also grown. The agricultural improvement of this area depends on extending irrigation ; its achievements and projects are described.—E.B.O.

423† HECQ, J. Le système de culture des Bashi (Kivu, Territoire de Kabare) et ses possibilités. [**The agriculture of the Bashi (Kivu, Kabare Territory, Belgian Congo) and its possibilities.**] *Bull. agric. Congo belge*, 1958, **49**, No. 4, 969–1000, illus., Flemish summary. [Sta. Rech. Agron. INÉAC, Mulungu]

Information is given on climate, soils and agriculture in the Bashi region. The probable evolution of agriculture there, consequent on the introduction of a more intensive system, is discussed.—E.B.O.

424 SANTARENO, J. A. L. M. A agricultura na Guiné Portuguesa. [**Agriculture in Portuguese Guinea.**] *Bol. cult. Guiné portug.* 1957, **12**, No. 47, 355–83, illus.

425† BASAK, K. C. **Studies in the economics of farming in two districts of West Bengal.** *Indian Agriculturist* 1958, **2**, No. 1, 4–13. [Indian Cent. Jute Cttee, Calcutta]

A government-sponsored farm survey, on an appropriate sampling design, was carried out in 2 districts in the industrial belt of West Bengal. Rice is the most important crop ; other food crops are wheat, gram, and sugar-cane. Of cash crops, jute is the most important and yields are good. Yields of other crops are poor. The survey covers such aspects as land tenure ; size of farm ; fragmentation of holdings ; irrigation ; labour ; bullock power (the only power available to the farmer) ; manure ; implements ; capital investment ; debts ; and an analysis of costs and production, from which it is shown that many farms run at a loss. The central cause of the backward condition of agriculture is the small size of the farms and their fragmentation. The largest farms are from 10–15 ac. ; the average size is less than 3 ac. Of the 600 farms sampled, 58% were less than 2·5 ac. and 33% less than 1·25 ac. On an average, the farms consist of 8 pieces of land, each about 0·3 ac. or less. The first step in improving agriculture here is to combine small farms in groups of, say, 10.—D.B.

426† BARRIE, J. W. **Population-land investigation in the Chimbu Sub-district.** *Agric. J. Papua* 1956, **11**, No. 2, 45–51. [Dep. Agric. Goroka, New Guinea] [Received Oct., 1958]

Information is given on land tenure, agriculture and land resources in the Chimbu Subdistrict of New Guinea.—E.B.O.

427† CATALA, R. L. A. **Report on the Gilbert Islands : some aspects of human ecology.** *Atoll Res. Bull. 59 Pacif. Sci. Bd* 1957, pp. 187, bibl. 39, illus.

Information is given on climate, soils, vegeta-

tion and crops. Among the recommendations made is the establishment of an agricultural experiment station which should have educational, as well as technical, functions.—E.B.O.

428† AARTSEN, J. P. van. **Report to the Government of Brazil on agriculture in north-eastern Brazil and means of improvement.** *Rep. 673 FAO* 1957, pp. 85, map.

The object of this report was to assist the Banco do Nordeste do Brasil in the elaboration of a project for developing agriculture in the north-east, an area of 1,222,000 sq. km., including 8 states from Piauí to Bahia. General information is given on the region, which has a tropical climate with areas of differing rainfall and vegetation types. The present condition of agriculture, and the possibilities of improving it, are examined. It is estimated that of the total area, about 175,000 sq. km. only may be used for intensive agriculture (arable farming and livestock-rearing) ; these include regions with sufficient rainfall or those which can be irrigated, and which are, at the same time, favourably situated in relation to markets. The remaining area, a great part of which is difficult of access, should be used for livestock-rearing only. There are 15 appendices which give detailed information on the region.—E.B.O.

429 CAVE, W. E. **My impressions of Russian agriculture.** *J. agric. Econ.*, 1958, **13**, No. 1, 35–42, bibl. 2.

The author gives his impressions of agriculture in the USSR based on a visit there in 1957.—C.L.S.

LAND USE

430† WORLD CROPS. **Land utilisation in Britain.** *World Crops* 1958, **10**, No. 4, 139–42, illus.

The following contributions were presented at a symposium on the " Biological productivity of Britain " held in London under the auspices of the Institute of Biology: The land-use pattern of Britain by L. Dudley Stamp ; Present agricultural production by H. G. Sanders ; and The recent history of land use by G. P. Wibberley.—E.B.O.

431† FAO. **Report of the Centre on Land Problems in the Near East.** Salahuddin, Iraq (1–21 October, 1955). *Rep. 689 FAO* 1957, pp. 39.

Delegates from Afghanistan, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Pakistan, Saudi Arabia, Sudan, Syria and Turkey discussed the most important problems arising from ownership and use of land in their respective countries and in the whole region. The main issues discussed concerned land-tenure systems.—E.B.O.

432† IDIA. Utilización y conservación del suelo. [**Land utilization and soil conservation.**] *Idia* 1957, No. 114, 1–46, bibl. 46, illus., map.

This report by a committee of many specialists gives information on the utilization and management of land in Argentina and the possibility of developing agricultural and livestock production. For the purpose of this study, the country is divided into 3 natural regions running approximately from north to south : a humid region, most of which is in the north-east ; a semi-arid central region ; and an arid region, the widest, which comprises almost all the western part of the country.—E.B.O.

433† PRINZI, D. Consolidamento della struttura fondiaria in Francia. [**Consolidation of agricultural holdings in France.**] *Ital. agric.* 1958, **95**, No. 8, 443–62, bibl. 24, illus.

LAND RECLAMATION

434† ROBERTSON, R. A. **Peat reclamation.** *Trans. roy. Highl. agric. Soc. Scot.* 1957, **2**, (6th series), 38–54.

Historical aspects and modern methods of peat-land reclamation are discussed.—A.M.H.

435† PICARD, J. and DUTHIL, J. Essais de rénovation des marais de l'Ouest. [**Trials to reclaim the marshes of western France.**] *Bull. tech. Inform.* 1958, No. 130, 289–301, illus.

The drained marshes of western France cover a wide coastal area between the Loire and the Gironde in several departments (about 100,000 ha. in the Charante-Maritime alone). They consist mainly of poor grasslands affected by drought in summer (the principal species present are given). A brief account is given of studies and trials to improve this land. The methods adopted consist mainly in cultivating and then growing pioneer crops for 2–3 years before long-duration meadows are sown. The pioneer crop particularly recommended is wheat ; yields up to 4000 kg./ha. are obtained from Cappelle. Oats, fodder-maize and Italian ryegrass (the last sown in September) are also grown.—E.B.O.

436 MORANI, V. Ricerche e sperimentazioni compiute nella bonifica di Arborèa (Cagliari). [**Investigations and experiments in the land reclamation area at Arborèa (Cagliari, Sardinia).**] *Publ. 131 Ann. Sta. chim.-agr., Roma Ser. 3*, 1956–7, pp. 40, bibl. in text, illus.

Information is given on agriculture in the reclaimed land of Arborèa, 9000 ha., more than 8000 of which are irrigated. The reclamation work, which started about 30 years ago, has changed an unproductive land, partly coastal dunes and partly marshes, into the most productive of Sardinia. The

principal crops grown include wheat, maize and ugar-beet.—E.B.O.

437 Société des Agriculteurs du Maroc. Études expérimentales effectuées sur les ols des merdjas côtières du Rharb. **[Experimental studies on the soils of coastal swamps of the Rharb (Morocco).]** *Bull. 70 Soc. Agric. Maroc* 1956, 23–66. [Received March, 1958]

The drainage works in the Rharb are concerned mainly with reclaiming the coastal merdjas (swamps which are often dry in summer), an area of about 8000 ha. The soils of this region are calcareous clay, saline and porous. The following contribution is included : Trials in growing crops at the experimental station of Merdja Daoura, by W. Hutter, pp. 39–43. The crops tested included barley, flax, berseem, maize, cotton and beans which, on the whole, showed good adaptation, but barley suffered from lodging, flax from rust attack, maize from the pest *Sesamia* sp. and cotton from *Earias* sp. The crops were also affected by weeds, mainly *Chenopodium rubrum* and *Rumex paluster*. In the first years it is advisable to grow autumn crops, cereals in particular, which give a good soil cover. —E.B.O.

438† Stoneman, T. C. **Salt land—programme for autumn.** *J. Dep. Agric. W. Aust.* 1958, **7**, No. 3, 359–60.

Recommended treatments for slightly salt-affected land are : sowing oats, barley or early-strain Wimmera ryegrass [*Lolium rigidum*], as a scratched-in crop, just before, or soon after, the first rains. For more seriously affected areas, rough cultivation to encourage leaching and to trap windborne seeds of native salt-tolerant plants, fencing-off affected areas and avoiding over-grazing and fallowing are recommended.—A.M.H.

FARMING SYSTEMS AND PRACTICES

See also Abs. 517, 518, 520

439 Wolfe, J. S. **Rotary cultivation.** *Fm Mechaniz.* 1958, **10**, No. 110, pp. 294–7, bibl., illus.

This is a review article.—C.L.S.

440 Hansen, C. M. and others. **Deep plowing —a progress report.** *Quart. Bull. Mich. Agric. Exp. Sta.* 1958, **40**, No. 4, 966–71, illus.

The equipment and power requirements for disc-ploughing to 26 in. are described. The yield response of maize to fertilizers placed in the furrow bottom are recorded.—M.H.F.

441 Singh, K. and Pollard, A. G. **Relationship between soil structure, soil cultivation, nitrogen uptake and crop growth. 3. Effects of cultivation on the porosity of soil and its compactness and on crop development and yields.** *J. Sci. Fd Agric.* 1958, **9**, No. 7, 454–62, bibl. 9. [Agric. Chem. Dep., Imp. Coll. Sci. Technol., London]

[See *Fld Crop Abstr.* 10 : 328.] Cultivation treatments were : deep ploughing (8 in.), shallow ploughing (4 in.) and surface treatment (2 in.) with a tine cultivator. Deep ploughing produced a greater number of branch roots in wheat than did tine cultivation. Differences in the effects of deep and shallow ploughing were not significant. No significant differences between the treatments were found in the number or length of main roots, or the dry weights of roots or shoots, in wheat, or in plant number per unit-length of row, dry weight or final yield in wheat or swedes, except that in the earlier growth stages of swedes in unmanured plots, deep ploughing produced greater weights of crop than did either shallow ploughing or tine cultivation. The top/root ratios in wheat were higher after ploughing than after tine cultivation. The type of cultivation had no effect on the size of swede roots. Lower percentages of smaller aggregates were associated with greater dry weight of swedes in the earlier part of their growth. None of the other plant characteristics examined was correlated with aggregation, or pore-space. F.S.—A.M.H.

442 Singh, K. and Pollard, A. G. **Relationship between soil structure, soil cultivation, nitrogen uptake, and crop growth. 4. Effects of cultivation on nitrate accumulation in soil, nitrogen uptake and crop growth.** *J. Sci. Fd Agric.* 1958, **9**, No. 7, 463–72, bibl. 8. [Agric. Chem. Dep., Imp. Coll. Sci. Technol., London]

The effects of cultivation treatments on N uptake closely followed those previously reported for crop growth. [See previous abstract.] In swedes at an early growth stage, N uptake was greater in deep-ploughed than in shallow-ploughed or tine-cultivated plots. At later growth stages in swedes and in spring wheat, there were no significant differences between cultivation treatments in either total N in dry matter/ac. or N as % of total dry matter. At the mid-stage of spring wheat growth, the total N in dry matter per ac. was less in tine-cultivated than in ploughed plots, but not significantly so. The amounts of N removed from the soil are discussed in relation to other published data.—A.M.H.

443 Fengchow, C. Ma. **On the agricultural mechanization in Taiwan.** *Chinese-Amer. Joint Comm. Rural Reconstr. Pl. Industr. Ser. 14.* 1957, pp. 73, illus., bibl. 33.

444† FAO. **Report on the Training Center and Study Tour on Irrigation and Drainage held in the U.S.S.R. (7 August to 17 September 1956).** *Rep. 718 FAO* 1957, pp. 131, illus., maps.

This training centre and tour were organized by FAO, with the co-operation of the Government of the USSR, the object being to acquaint technicians from FAO member countries with the progress made in water developments in the USSR, and to establish a permanent exchange of information. The academic part of the training, held in Moscow from 7 to 16 Aug., was followed by a tour in Uzbekistan, Azerbaijan and southern Ukraine. Participants came from Ceylon, Egypt, India, Iran, Pakistan, Sudan, Syria, Tunisia, USSR and Yugoslavia. There was an observer from Australia. There is an account of the lectures given, which were all by Soviet scientists and technicians. Irrigation in the USSR has developed mainly in the arid and semi-arid areas of central Asia and Trans-Caucasia, and was mainly directed, at least at the outset, to increased cotton production. It has since spread to other areas of low rainfall such as the lower Volga, southern Ukraine and the Crimea. In many areas the supply of water for villages and livestock is a main objective, often combined with small irrigation schemes for forage crops. In the humid areas large drainage schemes are being undertaken.—E.B.O.

445† Soares, R. N. G. A irrigação por aspersão. [**Sprinkler irrigation.**] *Agronomia, Rio de J.* 1956, **15**, No. 1–2, 23–51 and No. 3, 253–64, bibl. in text. [Received Sept., 1958]

This article is based on published literature.—E.B.O.

446 Yokota, R. and others. **Studies at the Wind Preventing Institution in San-in District. 2. The effect of shade cast by the windbreak equipment on soil temperature during the summer season.** [Japanese] *Trans. Tottori Soc. agric. Sci.* 1957, **11**, No. 3, 179–86, English summary. [Tottori Univ.]

447† Yokota, R. and others. **Studies on the wind-preventing methods in San-in District. 3. The effect of the wind-break equipment in a cultivated field upon the soil temperature in the winter season.** [Japanese] *Trans. Tottori Soc. agric. Sci.* 1958, **11**, No. 4, 271–5, bibl. 2, illus., English summary. [Tottori Univ., Japan]

448† Caborn, J. M. **Notes on shelter research in North America.** 1957, pp. 18, bibl. in text, Penglais, Aberystwyth : Dep. Anim. Husb., Inst. Rural Sci. [Received April, 1958]

Tree-shelter research in Canada and USA is reviewed under the heads : forestry aspects, climatological aspects, allied research.—A.M.H.

449 Grillot, G. and Mutter, W. Essais d'assolements (Ferme Expérimentale de Fès). [**Crop rotation trials at the Experimental Farm at Fez (Morocco).**] *Terre maroc.* 1958, **32**, No. 343, 213–20. [Cent. Rech. Agron., Rabat]

An account is given of 2-, 3-, 5- and 6-years' rotation trials. Results showed that : (a) a green manure increased the average yield of wheat by 200–300 kg./ha. over the yield obtained after a cultivated bare fallow, and doubled the flax yield compared with the yield after beet ; (b) beet, or a legume grown for seed, was better before wheat than a cultivated bare fallow, and even better than a cultivated fallow with a green manure ploughed-under.—E.B.O.

450 Mann, H. H. **Field studies in green manuring. 1.** *Emp. J. exp. Agric.* 1958, **26**, No. 103, 274–82, bibl. 4. [Woburn Exp. Sta.]

The effect of lupins, vetches or mustard as green manure, buried in a light soil under favourable moisture conditions, was measured by the yield of a kale crop grown immediately afterwards. The effects of removing the whole crop, leaving the roots only, or burying whole plants or whole plants + extra tops, were compared. The beneficial results were not directly related to the amount of N or of organic matter in the buried material. Kale yields following lupins or vetches, with no roots or tops buried, were, respectively, 16% and 10% higher than those after mustard. Burial of roots of mustard decreased the subsequent kale yield by 12%. Burial of legume roots was slightly beneficial. Burial of whole plants increased yields (compared with those where the green-manure crop was completely removed) by 10·5% after mustard, 63% (2·8 tons/ac.) after lupins and 58% (2·4 tons/ac.) after vetches. When compared with yields after ploughing-in weed herbage only, the mustard plots yielded 9% less and the lupin and vetch plots 55·5% and 43% more, respectively, than the control. The residual effect of green manuring with lupins was measured. The beneficial effect had practically disappeared after the 2nd kale crop.—A.M.H.

451 Department of Agriculture, Ghana. **Agronomic research.** *Rep. Dep. Agric. Ghana 1955–6*, 1958, 8.

At Kwadaso, the effect of different fallow crops grown for 3 years was measured by a first test crop of maize. Fallow crops, and maize yields in lb. dry grain per acre, were as follows : Giant star grass [*Cynodon plectostachyus*] 1752, Guinea grass [*Panicum maximum*] 1752, Elephant grass [*Pennisetum purpureum*] 1742, Pigeon pea [*Cajanus cajan*] 1691, *Calopogonium* [*mucunoides*] 1589, permanent cropping (no fallow) 1127.—G.L.S.

452† Dyk, G. J. van. **Planned farming—more**

than profitable. *Fmg in S. Afr.* 1958, **34**, No. 4, 49–53, illus.

The soil conservation measures, crop rotations and pasture improvement methods used on Doornfontein Demonstration Farm, Swartland, are described. The yields of wheat, oats, barley, sweet lupins, wool and milk, and the gross income, are tabulated for 1947–57.—A.M.H.

453 TANNER, R. E. S. **Subsistence agriculture on the Tanganyika coast. (An analysis of some reasons for the failure of smallholding agriculture in Pangani District, Tanga Province.)** *E. Afr. agric. J.* 1958, **24**, No. 1, 70–5. [Prov. Admin., Tanganyika]

454† OEEC. **Farm management in the United States. Report by a group of [visiting] experts.** *Project 395/B OEEC* 1958, pp. 126, illus.

455† JEFFREY, A. G. **Records and accounts for farm management.** *Bull. 176 Minist. Agric. Fish., Fd, England and Wales* 1958, pp. 75, London : H.M.S.O.

456† TANAKA, Y. and MURAMATSU, I. **[Studies on correlations between profits and intensity of farming in Japan.]** [Japanese] *Bull. Fac. Agric. Shizuoka Univ.* 1957, No. 7, 38–45, bibl. 8, English summary.

SOIL AND WATER CONSERVATION

457 PEREIRA, H. C. and others. **Water conservation by fallowing in semi-arid tropical East Africa.** *Emp. J. exp. Agric.* 1958, **26**, No. 103, 213–18, bibl. 13, illus. [E.A.A.F.R.O. and Tanganyika Agric. Corp.]

Crop yields and soil-moisture changes to 6-ft. depth were measured in 2 cycles of five 2-yr. groundnut rotations at Kongwa Experimental Farm. Fallows kept bare, sown with teff (*Eragrostis abyssinica*), or allowed to regenerate naturally were compared with maize or sorghum in alternate-year cropping with groundnuts. Soil-moisture-tension changes were followed, using gypsum blocks, and quantitative changes were measured by soil sampling. Roots of groundnuts, maize and sorghum all reached 5–6 ft. The main development of teff roots was in the 1st foot. In 1953, with 8·5 in. of rain, groundnut yields following bare or teff fallow were 410 and 482 lb./ac., respectively, approximately double those following volunteer cover, sorghum or maize. Teff provided complete protection from wind- and water-erosion. In 1955, the highest groundnut yield (1053 lb./ac.) followed bare fallow. Teff, used at a lower seed-rate than in the previous cycle, gave results similar to the cereals. In both cycles, the lowest yields were those following sorghum. Bare and protected fallows stored water at 2–6 ft. At the end of the 1952 dry season there was little difference in moisture content of the bare and teff-protected fallows. Under volunteer cover, the whole 6-ft. profile was reduced to wilting point in both years. Maize in 1952 and '54 did not dry out the profile completely. Sorghum used as much water as did the volunteer cover. After trials with teff sown at 0, 15, 30 and 45 lb./ac. (25% germination rate), it was concluded that about 20 lb. viable seed/ac. is needed for successful water conservation.—A.M.H.

458† SOIL AND CROP SCIENCE SOCIETY OF FLORIDA. **Symposium: Florida's water resources and utilization.** *Proc. Soil and Crop Sci. Soc. Fla* 1956, **16**, 32–126, bibl. at end of papers. [Received July, 1958]

The symposium included papers on : Engineering aspects of agricultural water resources, by H. C. Gee ; Ground water as a resource in Florida's agriculture, by R. O. Vernon ; The utilization of water by agriculture in Florida, by J. M. Myers and T. C. Skinner.—A.M.H.

459† FAO. **Report on the Development Center on Watershed Management, India.** *Rep. 703 FAO* 1957, pp. 62.

This report based on lectures and discussions which took place at the centre at Hazaribagh, Bihar, 18 Feb.–14 March, 1957, is a digest of the major aspects of watershed management, with emphasis on the Far East. A list of lecture papers and country reports is given.—E.B.O.

460† BLYTH, F. G. H. **The use and conservation of underground water.** *Chem. and Industr.* 1958, No. 37, 1182–4, bibl. 5. [Geol. Dep., Imp. Coll. Sci. Technol., London]

In this paper read at a meeting of the Agriculture Group in Dec., 1957, an outline is given of the availability, use and conservation of underground water, mainly in eastern England.—E.B.O.

461† MUCKEL, D. C. and SCHIFF, L. **Replenishing ground water by spreading.** *Australas. Irrigator* 1958, **3**, No. 4, 11–14 and 35–7.

Basin, furrow and flooding methods and the use of pits, shafts and wells for replenishing groundwater are described, and the relative merits of the different methods discussed. Cotton-gin trash incorporated in the soil, or a cover of Bermuda grass [*Cynodon dactylon*], increased infiltration rates appreciably.—A.M.H.

462† LAUCIANI, E. **The technique and economics of stone-clearing.** *Fatis Rev.* 1958, **5**, No. 4, 101–5, illus.

In Italy, vast areas of the hills and mountains which were originally forest or natural grassland, are now eroded, stony soils. The stones can be used in erosion control, in particular for building low walls, more or less parallel to the contour, with the object of dividing the hillside into strips, each of which has a separate water system. If the gradient of the land is less than 20% the land is suitable for general cultivation ; if more, it is suitable for plantation crops and forest. The stones are also used for small dykes and drainage works. The economics of these operations is illustrated by results obtained on a farm in Potenza province.—E.B.O.

463† Cormack, J. M. **The construction of small earth dams.** *Rhod. agric. J.* 1958, **55,** No. 3, 253–85, illus. [Fed. Dep. Conserv. and Extension, Rhodesia]

464† Edwards, J. A. **Structures aid gully control.** *J. Dep. Agric. S. Aust.* 1958, **61,** No. 10, 465–75, bibl. 2, illus.

Vegetation may be used for controlling gullies up to 6 ft. deep, e.g.: by constructing grassed chutes; by planting strips of sod-forming grasses down the middle, or across, a gully at intervals as silt traps; or by planting willows or poplars in trenches on the sides of a gully. Mechanical methods described include the " verandah chute", a galvanized iron chute sending water beyond the gully head, and the use of black plastic sheeting to cover the gully head and the shoulders of the earth banks. The construction and function of various masonry and concrete structures for gully-head control are discussed.—A.M.H.

465† Ito, K. and others. [**Studies on the cropping system of hillside farms from the standpoint of erosion control. 2. On the effects of erosion control by summer intercropping or winter cropping with green manure.**] [Japanese] *Bull. Shikoku Agric. Exp. Sta.* 1957, **3,** 21–46, bibl. 25, English summary.

On hillside farms in warm regions of Japan, 2 crops per year are grown, viz., wheat and maize or wheat and sweet-potato. Because of the periodic heavy rainfall and absence of plant cover, this cropping system results in soil erosion. To prevent this, experiments were conducted in which forage grasses were grown in winter, and intercropping of maize with lespedeza or sweet-potato with soyabean (for soiling) was practised in summer. Results: intercropping of maize with lespedeza reduced run-off by *c.* 50% ; a water-conserving effect of the winter grass-cover was observed only when maize and lespedeza were the summer crops. Intercropping with lespedeza decreased the yield of maize but produced 500 kg./ha. lespedeza (fresh weight). Intercropping with soyabean reduced the sweet-potato yield by 10% in the first 2 years, after which there was no reduction in yield. After ploughing-in the lespedeza, the wheat yield in the following year was 15% higher than in the control plot. Intercropping with lespedeza increased the moisture-retaining property of the soil and proved to be the best practice before an upland rice crop. F. Eng. S.—D.B.

466† Morland, R. T. **Erosion survey of the Hume catchment area. 1. Physiography, geology, soils and climate.** *J. Soil Conserv. N.S.W.* 1958, **14,** No. 3, 191–225, bibl. 43, illus.

467† Logan, J. M. **Erosion problems on salt affected soils.** *J. Soil Conserv. N.S.W.* 1958, **14,** No. 3, 229–42, bibl. 18, illus.

The causes of high soil salinity, and its effects on plants and on soil structure and stability, are discussed. The effects of rainfall, cultivation, mulching and plant growth on salt concentration in the soil profile are noted. In a series of field trials, *Phalaris tuberosa, Ehrharta calycina* and lucerne all established well under mulches of lucerne hay (4–6 in.), sheepyard manure (1 in.) or sawdust (0·25–0·5 in.), lucerne hay giving the best results. There was no establishment on adjoining non-mulched plots. In trials on the use of cereal cover crops, initial response by the pasture spp. was poor, but barley and rye gave better results than wheat. There was no germination of sown spp. on the plots without cereals, but high rainfall in the following year caused prolific growth of annual beard grass (*Polypogon monspeliensis*) and *Ph. tuberosa* established well under the mulch produced by this. Of the pasture spp. used, *Ph. tuberosa* was outstanding; *Paspalum vaginatum* and *Festuca arundinacea* also established well. Strawberry clover (*Trifolium fragiferum*) was the most promising legume, although establishment was sometimes difficult.—A.M.H.

468 Burvill, G. H. **Cereal rye will grow on wind-eroded areas.** *J. Dep. Agric. W. Aust.* 1958, **7,** No. 3, 363–4.

Wind-eroded areas of sandy soil may be reclaimed by sowing, after good autumn rains, 40–60 lb. rye/ac. with 1 cwt. of a 3 : 1 or 1 : 1 superphosphate/ammonium sulphate mixture per ac., or superphosphate alone, on drift sand. Stocking late in the following summer to shed and trample-in seed, and the introduction of lupins or subterranean clover in the 3rd year is recommended.—A.M.H.

469† Sless, J. B. **Planting guide for coastal sand drift stabilisation.** *J. Soil Conserv. N.S.W.* 1958, **14,** No. 3, 184–90, bibl. 5, illus.

The classification of sand-stabilizing plants previously given [see *Fld Crop Abstr.* 11 : 1814] is followed. The degree of tolerance of each species to

drift accumulation, sand blast, salt spray and low nutrient supply, and also its habit, method of propagation, time of planting or sowing, and the locations for which it is suitable, are tabulated.—A.M.H.

470† Hutchinson, J. and others. **On the characterization of tropical rainstorms in relation to runoff and percolation.** *Quart. J. roy. met. Soc.* 1958, **84,** No. 361, 250–8, bibl. 3. [Emp. Cott. Gr. Corp., Namulonge, Uganda]

In studying the effect of cropping practices or soil treatments, susceptibility to soil erosion is usually measured in terms of runoff. As runoff depends on rainfall intensity the use of percolation rate is to be preferred as an index of the effect of a surface treatment. It is shown that percolation rates can be estimated from the linear regression of amount of rain and rate, together with runoff data.—C.L.S.

AGRICULTURAL METEOROLOGY AND CLIMATOLOGY

See also Abs. 356, 530

471† Matzner, F. Die Hagelgefährdung in den südlichen Bezirken der Deutschen Demokratischen Republik. [**Hail damage in the southern districts of Eastern Germany.**] *Dtsch. Landw.* 1958, **9,** No. 7, 339–43, bibl. 8, illus. [Inst. Acker- u. PflBau, Univ. Jena, E. Germany]

The southern part of Eastern Germany is subject to severe hail damage. Maps have been produced, based on insurance claims between 1946 and '53, which show the frequency of hail years in the districts of Erfurt, Suhl, Gera, Dresden, Leipzig and Karl-Marx Stadt. A " hail year " is one in which at least one crop-damaging hailstorm occurs in a given District irrespective of the severity of the damage, the extent of the damaged area or the number of times hail damage occurs during that year. The maps reveal zones of hail damage ; they can be used in assessing future risks.—D.B.

472† Uehara, M. and Uzumaki, M. **Studies on the relation between the underground temperature and the inclination of the slope. On the underground temperature on the northern slope. Pt 1.** [Japanese] *Trans. Tottori Soc. agric. Sci.* 1958, **11,** No. 4, 262–70, bibl. 4, illus., English summary. [Kagawa Univ., Japan]

Every 2 hr. on fine days early in September, 1956, observations were made on underground temperature, solar radiation, and evaporation on northern slopes at an inclination of 0, 5, 10, 20, 30 and 35°. The results were used to study the influence of angle of inclination and aspect of slope on underground temperature. F. Eng. s.—D.B.

473† Harrold, L. L. **Lysimeter checks on empirical evapotranspiration values.** *Agric. Engng, St. Joseph, Mich.* 1958, **39,** No. 2, 94–7, bibl. 4. [Soil and Water Conserv. Res. Sta., Coshocton, Ohio]

In trials in Ohio, comparisons were made between evapotranspiration values during May to August as measured by a weighing lysimeter and as estimated by different empirical methods, including those of van Bavel, Thornthwaite, and Blaney and Criddle. Crops used were maize and second-year lucerne/timothy [*Phleum pratense*] stands. Though the use of empirical methods could give values for accumulated seasonal evapotranspiration close to those given by lysimeter measurements, there were considerable discrepancies between monthly values in some cases, particularly where bare ground was involved or where forage crops were cut for hay. It was thought that corrections for these factors could be incorporated into the empirical procedures.—P.J.B.

474† Blaney, H. F. **Climate as an index of irrigation needs.** *Australas. Irrigator* 1958, **3,** No. 8, 9–12.

The use of climatical, geographical and crop data for assessing irrigation needs is discussed.—A.M.H.

475† Wilson, W. T. and Hershfield, D. M. **Frequency analysis of rainfall intensity data.** *Agric. Engng, St. Joseph, Mich.* 1958, **39,** No. 6, 344–7, 353, bibl. 5.

The relationship between 24-hr. rainfall and that for shorter intervals, obtained from first-order metereological stations, permits data from other stations, which report only the daily total, to be incorporated into isopluvial maps. The relation between a partial-duration series, i.e. the n highest daily rainfall values in n years, and an annual series, i.e. the highest daily value for each year of the record, and the advantages of the latter, are discussed. A graph correlating maximal 60-minute rainfall with clock-hour rainfall was prepared. Graphic representation of intensity, frequency and duration data is superior to algebraic computations. Diagrams are presented for interpolating between isopluvials of the same frequencies showing rainfalls for varying duration intervals, or in maps having different return periods, for converting point-data into average rainfall depth for areas up to 400 sq. miles and for representing the probability of receiving rain of a given intensity in any month as calculated from records over the past n years.—A.M.H.

476† Air Ministry Meteorological Office. Great Britain. **Tables of temperature,**

relative humidity and precipitation for the world. Pt 1. North America, Greenland and the North Pacific Ocean. (*Bull. M.O. 617a*) 1958, pp. xi + 84, illus., London : H.M.S.O., 24 × 15 cm., 8s. **Pt 4. Africa, the Atlantic Ocean South of 35°N. and the Indian Ocean.** (*Bull. M.O. 617d*) pp. xii + 220, illus., London : H.M.S.O., 24 × 15 cm., 20s. **Pt 5. Asia.** (*Bull. M.O. 617e*) pp. ix + 129, illus., London: H.M.S.O., 24 × 15 cm., 12s. **Pt 6. Australasia and the South Pacific Ocean including the corresponding sectors of Antarctica.** (*Bull. M.O. 617f*) pp. ix + 54, illus., London: H.M.S.O., 24 × 15 cm., 5s. 6d.

477† Albuquerque, J. P. M. Zonagem pluviométrica do continente portugues. [**Rainfall zones in Portugal.**] *Agron. lusit.* 1957, **19**, No. 1, 71–100, and No. 3, 263–94, bibl. 6, illus., French summary. [Esta. Agron. Nac., Sacavém, Portugal]

478† Guimarães, C. As chuvas na Guiné Portuguesa. [**Rainfall in Portuguese Guinea.**] *Bol. cult. Guiné portug.* 1957, **12**, No. 47, 315–32, illus., maps, English and French summaries.

479 Mallik, A. K. **An examination of the crop yields at crop-weather stations with special reference to rainfall.** *Indian J. Meteor. Geophys.* 1958, **9**, No. 1, 1–8.

Some outstanding examples of the effect of rainfall on the yields of rice, wheat, sorghum and cotton crops, over large contiguous areas as seen from the crop-weather data collected so far are presented and discussed. [From *Cent. Bd Irrig. Abstr.* 1958, No. 218 : 167.]—D.B.

480† Kvifte, G. and Heldal, B. Ås-klimaet. 1. Meteorologiske middelverdier for Ås. **The climate of Ås. 1. Meteorogical means at Ås.** *Meld. Norg. LandbrHøisk.* 1958, **37**, No. 8, pp. 16, bibl. 10.

The data reported were recorded at the Meteorological Station of the Royal Agricultural College in south-eastern Norway.—P.J.B.

481† Sachet, Marie-Hélène. **Climate and meteorology of the Gilbert Islands.** *Atoll Res. Bull. 60 Pacif. Sci. Bd* 1957, pp. 19, bibl. 8.

The climate of the Gilbert Island is oceanic and tropical, devoid of great fluctuations in temperature and almost without severe storms. A summary of probable weather conditions, with some tabulated meteorological information, is presented.—E.B.O.

MISCELLANEOUS

482 Chaffin, W. and Granstaff, E. [**Crop varieties recommended for Oklahoma, 1957.**] *Circ. 653 Oklahoma Agric. Exp. Sta.* [n.d.], pp. 19.

Varietal recommendations are given for white and yellow hybrid maize, cotton, grain sorghum, broomcorn, winter wheat, winter and spring oats, winter barley, rye, soyabeans and groundnuts.—P.J.B.

483 Rural Research in C.S.I.R.O. **Crops and pastures for Northern Australia.** *Rur. Res. C.S.I.R.O.* 1958, **24**, 13–21, bibl. 2, illus. [Katherine Res. Sta., N. Territory]

Results obtained at the Katherine Research Station are reviewed. The rainfall pattern limits the growing season to 18–20 weeks. Crop establishment presents special problems ; e.g., the onset of the wet season coincides with very high temperatures and dry periods may occur during the wet season. Marked responses to P, and to N in the presence of P, have been found. On the heavier soils, disc or mouldboard ploughs have given better results than tined implements. Deep ploughing (6–7 in.) gave higher yields of grain sorghum than shallow ploughing (2·5–3 in.) Coarser seedbeds were necessary than in temperate climates. Groundnuts. Yields of 1200–2500 lb./ac. have been obtained. Late December was the best sowing time and 1 cwt. superphosphate/ac. was necessary on virgin land. Row-spacings of 14 in. yielded 2724 lb./ac., 28-in. spacings, 2249 lb./ac. and 42-in. spacings, 1702 lb./ac. Sorghum. Yields ranged from 1000–3000 lb./ac. Sowing between mid-December and mid-January generally gave satisfactory yields. Hegari and Kalo were the most suitable varieties. Seed-rates and row-spacings had little effect on yield, except in so far as they affected inter-row cultivation, which increased yields considerably. Cotton yields averaged about 500 lb. seed cotton/ac. Among other crops which showed promise were : safflower (*Carthamus tinctorius*), sunflower (*Helianthus annuus*), guar (*Cyamopsis tetragonoloba*), Bambarra nut (*Voandzeia subterranea*), bulrush millet [*Pennisetum typhoideum*], broom millet (*Sorghum vulgare*), kenaf and roselle (*Hibiscus* spp.).—A.M.H.

484† Arnold, P. W. and others. **Aspects of Soviet agricultural research. A report on a visit to the Soviet Union from 20 October —20 November, 1957.** *Mimeo. publ.* [1958], pp. 55.

An account is given of the research projects in various institutes and University departments centred in Moscow, Leningrad and Kiev. The report is in 6 parts and includes outlines of studies on : plant physiology and breeding ; the physical environment of plants ; plant nutrition ; and soil

microbiology. The research projects include those dating back for many years, (e.g. the work of Čaĭlahjan on plant growth and development ; Tumanov's researches on the resistance of plants to low temperatures ; and the Kiev studies of sugar-beet) in addition to more recent lines (e.g. work of the Ecological Physiology Department [under Keller, Inst. of Plant Physiol., Moscow], on problems of crop growth in the far north ; seed storage under air conditioning (at the All-Union Institute of Plant Industry, Leningrad) ; and the study of temperatures, in and around crops, for which work the Semi-Conductors Institute at Leningrad has been established. At this Institute, Kaganov has recently designed a thermo-couple circuit including a thermistor (as a °T compensating element) which will simulate the psychrometer equation over a wide temperature range and can therefore be used to give a direct measurement of absolute humidity. Other instruments have been developed at this Institute to measure the work done by a tractor during cultivation with different implements and at different soil moistures ; and to measure the forces required to bend and to cut straw. Finally mention may be made of the work of the Hydrological Institute, Leningrad, where study is in progress on the water-balance of marshland (of which there are 2 million sq. km. in the Soviet-Union) ; and to the Artificial Climate Laboratory (in the Timirjazev Agricultural Academy, Moscow) where work is done on the reflection and absorption of radiation by leaves.—M.H.

485† FAO. **The state of food and agriculture 1958.** Rome, 1958, pp. 222, bibl. in text, illus.

486 Colhoun, J. **Club root disease of crucifers caused by *Plasmodiophora brassicae* Woron. A monograph.** *Phytopath. Pap. 3 Commonw. Mycol. Inst.* 1958, pp. vi. + 108, bibl. pp. 96–108, illus.

A wide variety of recommended control methods is reviewed.—C.L.S.

487 Ministry of Agriculture, Fisheries and Food, England and Wales. **Leather jackets [*Tipula* spp.].** *Adv. Leafl. 179 Minist. Agric., Fish., Fd, England and Wales* 1958, pp. 4.

To prevent attacks on crops following grass-or clover-leys, the land should be broken up in July or early August, consolidated thoroughly and a good tilth obtained. Other recommended control measures are the use of 3 pt. 20% DDT or 2 pt. 30% aldrin miscible oil in 25 gal. water/ac., aldrin or γ-BHC wireworm dusts at 1·5–2 cwt./ac., or poison baits containing Paris green, DDT or γ-BHC.—A.M.H.

488† Entomology Division, Tasmanian Department of Agriculture. **The southern armyworm.** *Tasm. J. Agric.* 1958, **29,** No. 3, 250–3, illus.

Recommended measures for control of *Persectania ewingii* are : frequent and regular crop inspection, particularly of cereal crops with a ground cover of grass and weeds ; use of light traps for capturing adult moths to forecast outbreaks ; spraying with DDT at 4 oz. active ingredient/ac., or 8 oz./ac. for dense crops such as peas, in 10–15 gal. water ; dusting with 5% DDT dust at 8 lb./ac. —A.M.H.

489 Ito, S. and Yamamoto, F. **Studies on the physiological responses of some crops in relation to the organic phosphorated and the chlorinated insecticides. Pt 1. Influence on the germination of seeds and the seedlings of some crops.** [Japanese] *J. agric. Sci. Tokyo Nogyo Daigaku* 1957, **3,** No. 3, 281–302.

490† Bärner, J. Literaturquellen und ihre Kürzungen aus der Bibliographie der Pflanzenschutzliteratur. **[The sources and abbreviations of publications referred to in the Bibliography of Plant Protection.]** 1958, pp. 167, 29 × 21 cm., Berlin-Dahlem: Biologische Bundesanstalt für Land- u. Forstwirtschaft. [Not for sale.]

This mimeographed publication has been prepared to assist those using the Bibliographies of Plant Protection. [See *Fld Crop Abstr.* 11 : 421 and Abs. 531.]—D.B.

491† Manell, E. Försök med stallgödsel. 1. Försök med stallgödselns fördelning i växtföljden utförda i Norrland och delar av Svealand åren 1945–1955. **Trials with farmyard manure. 1. Trials with distribution of farmyard manure in the rotation of crops carried out in 1945-55 in Norrland and parts of Svealand.** *Medd. 95 Stat. JordbrFörsök.* 1958, pp. 41, bibl. 378.

There is an extensive bibliography of references to Scandinavian literature on the use of farmyard manure.—P.J.B.

492 Widdowson, F. V. and Cooke, G. W. **Comparisons between placing and broadcasting of nitrogen, phosphorus and potassium fertilizers for potatoes, peas, beans, kale and maize.** *J. agric. Sci.* 1958, **51,** No. 1, 53–61, bibl. 5, illus. [Chem. Dep., Rothamsted Exp. Sta., Harpenden, Herts]

In 8 experiments on main-crop potatoes in 1953–4, in which placed- and broadcast-N were compared in the presence of placed P and K, placing 0·5 cwt. N/ac. in a band beside the seed gave an average of 0·66 tons tubers/ac. more than broadcasting the fertilizer. At 1 cwt. N/ac., broadcasting gave an average of 0·32 tons/ac. more than drilling, but the difference was not significant. There were no consistent gains from placing

1·5 cwt. K_2O/ac., in the presence of drilled N and P. Four other potato experiments in 1954–6 tested all combinations of placing and broadcasting 2 levels of N and P. There was no clear relationship between the effects of broadcasting or placing one nutrient and the way in which the other was applied. Placing 0·5 cwt. N/ac. gave higher yields in 7 out of 10 comparisons (1 significant effect). With 1 cwt. N/ac., there were also 7 out of 10 comparisons in favour of placement (2 significantly so), but in 2 other comparisons broadcasting gave significantly higher yields. Placing K gave higher yields than broadcasting in 16 out of 20 comparisons (6 significant), but in one of the remaining comparisons broadcasting was significantly superior. In 2 experiments on broad beans [*Vicia faba*], placing of P and K separately and together gave consistently higher yields than broadcasting. When N was used as well as P and K, yield was slightly increased, provided that the mixture was placed. For kale in 1956, placing P, PK and NPK gave higher yields than broadcasting. In a maize experiment in 1956, all nitrogen dressings delayed maturity. Where N was placed (with or without K) it gave significantly lower yields than when broadcast. K increased yields slightly in the absence of N, placing being significantly better than broadcasting. F. s.—A.M.H.

493† Schmitt, L. and Brauer, A. Untersuchungen über die gegenseitigen Randbeeinflussungen verschieden gedüngter Teilstücke bei langjährigen Feld- und Wiesendüngungsversuchen. [**Reciprocal edge effects between differently manured plots in long-term arable and grassland experiments.**] *Landw. Forsch.* 1958, **11**, No. 1, 10–22, illus., English and French summaries. [Landw. Versuchsanst., Darmstadt, W. Germany]

Edge effects were investigated in plots of arable land and grassland which had undergone manurial trials for 54 and 40 yr., respectively. P_2O_5- and K_2O-content of the soil, and pH were determined. As a consequence of soil cultivation, mutual edge effects occurred in the arable experiment, often extending into the plots by 75 cm. or more. Only slight effects, confined to the utmost edge of the plots, were found on the grassland plots which were separated by shallow furrows 10 to 12 cm. wide. Consequently, plots in arable long-term experiments should be large enough to include discard strips 1 m. wide at the edges of the treated area. For grassland experiments no such guard strips are needed, provided that the plots are separated clearly by furrows, and herbage samples are not taken from their extreme edges. F. s.—D.B.

494 Raheja, P. C. and others. **Crop response to potash under Indian conditions.** *J. Indian Soc. Soil Sci.* 1958, **6**, No. 1, 29–48, bibl. 42. [Indian Agric. Res. Inst., New Delhi]

The economics of using potash fertilizers for rice, wheat, maize, sorghum, jute, cotton, potatoes and groundnuts are reviewed in the light of results of farm trials in several parts of India.—D.B.

495 Steenbjerg, F. Et tilfælde af stærk molybdænmangel i byg, kløver og bederoe. [**A case of severe molybdenum deficiency in barley, clover and beet.**] *Ugeskr. Landm.* 1958, **103**, No. 27, 403–4.

A note is given on a case of Mo-deficiency in clover, beet and barley crops on a farm near Ribe, in Denmark, on a light, ochreous-sand soil. Applications of 1 and 1·5 kg. sodium molybdate/ha. resulted in yield increases of 6·2 and 8·2 hkg./ha. grain, respectively, compared with untreated crops. The possibilities of localized Mo-deficiency in other parts of Denmark are discussed briefly.—P.J.B.

496† Michelson, L. F. and others. **The use of the "Weighted-Rankit" method in variety trials.** *Proc. Amer. Soc. hort. Sci.* 1958, **71**, 334–8, bibl. 3.

The Weighted-Rankit method allows for the numerical classification of strain and variety descriptions. Each trait is weighted according to its relative importance and integrated with other weighted characteristics. The data are subjected to variance analysis, which then permits a final quantitative comparison among all the items within the test. F. s.—A.M.H.

497 Lenger, Anne. Analyse d'un essai factoriel sur la betterave sucrière par la méthode des surfaces de réponse. [**Analysis of a factorial trial with sugar-beet by the response-surface method.**] *Publ. tech. Inst. belge Amélior. Better.* 1957, **25**, No. 4, 267–302, bibl. 9, English and Flemish summaries.

498† Geidel, H. Zur Variabilität der Einzelpflanze. [**The variability of the individual plant.**] *Z. Acker- u. PflBau* 1958, **106**, No. 1, 49–57, bibl. 2.

The magnitude of the variability of plant attributes is studied statistically and used for determining the optimum size of sampling unit of a crop plant.—D.B.

499† Gisborne, J. H. **Agricultural experimental records, Northern Nigeria.** *Trop. Agric., Trin.* 1958, **35**, No. 4, 241–50, illus. [Minist. Agric., N. Nigeria]

The system of record books, experiment log books and punched cards used for recording data from farm plot and field trials, and the machines and standard routine adopted for weighing and counting, are described.—A.M.H.

500† Kristensen, E. **Production and pro-**

duction functions in agriculture. *Årsskr. K. vet. Landbhøjsk.* 1958, 26–47, bibl. 12.

501† Ministry of Agriculture, Fisheries and Food, England and Wales. **Guide to the Seeds Acts and Regulations.** *Form SDS 6 Minist. Agric., Fish., Fd, England and Wales* 1956, pp. 11. [Received Feb., 1958]

502† Central Office of Information, London. **The promotion of the sciences in the Commonwealth.** 1958, pp. 56, bibl. 33, London : Cent. Off. Inform., Ref. Div.

The chief learned societies and the structure of the various national research organizations in the British Commonwealth are described. The growth and nature of the framework for inter-Commonwealth scientific collaboration are also dealt with, and, in this connexion, the organization, administration and methods of the Commonwealth Agricultural Bureaux are outlined (pp. 45–7).—C.L.S.

503† Inter-African Phyto-Sanitary Commission. **List of specialists in the phyto-sanitary field [in Africa South of the Sahara].** 1958, pp. 50, London : Commission for Technical Co-operation in Africa South of the Sahara.

504† Bisset, G. B. and Blagburn, C. H. **Financial results on farms in the Southern Province [of Great Britain] in 1954-55, 1955-56 and 1956-57.** *Fm Management Survey Rep.* 7, 1958, pp. 51, bibl. in text. [Reading Univ. Dep. Agric. Econ.]

505 Institute of Corn and Agricultural Merchants. **Oxford Conference, 1958.** *J. Inst. Corn agric. Merch.* 1958, **6**, No. 4, 188–228, illus.

Among papers presented were : The limits of crop production, by Prof. G. E. Blackman ; Some aspects of mechanizing crop production, by W. H. Cashmore ; Recent advances in the efficient use of fertilizers, by G. W. Cooke ; Recent developments in the provision of home grown foods for livestock, by M. H. R. Soper ; Some lines of research on grain storage, by T. A. Oxley.—A.M.H.

REPORTS

506 **Great Britain.** University College of Wales, Aberystwyth. Welsh Plant Breeding Station. Report 1950–1956. Aberystwyth, 1958, pp. 171, bibl. in text, 7s. 6d.

See Abstracts 25, 47.

507 **Great Britain.** Pea Growing Research Organisation Ltd. Annual Report 1957. Yaxley, 1958, pp. 22, 1s. 6d.

See Abstract 192.

508 **France.** Société d'Encouragement de la Culture des Orges de Brasserie et des Houblons en France. [Report for the season 1956.] [n.d.], pp. 73, illus. [Received July, 1958]

See Abstract 59.

509 **Cyprus.** Department of Agriculture. Annual Report for the year 1957. Nicosia, 1958, pp. 67.

See Abstracts 343, 407.

510 **Kenya.** Empire Cotton Growing Corporation. Progress reports from experiment stations. Season 1956–57. London, 1958, pp. 14.

See Abstract 326.

511 **Ghana.** Department of Agriculture. Annual Report for the year 1955–56. Accra, 1958, pp. 37, illus., 3s. 6d. [Received May, 1958]

See Abstracts 300, 338, 451.

512 **Basutoland.** Department of Agriculture. Annual Report 1957. Maseru, [n.d.], pp. 71, illus. [Received Sept., 1958]

See Abstract 100.

513 **British Guiana.** Director of Agriculture. Annual Report for the year 1955. Georgetown, 1958, pp. 62 + iii.

See Abstract 144.

514 **West Indies.** Empire Cotton Growing Corporation. Progress reports from experiment stations. Season 1956–57. London, 1958, pp. 10.

See Abstract 327.

BOOKS

515 Choudhuri, H. C. **Potato in West Bengal.** [1958], pp. 125, 25 × 19 cm., illus., bibl. 21 and at end of chaps, Calcutta : Dir. Agric., Govt W. Bengal, 9s. 9d.

"The cultivation of potatoes is of great importance in densely populated under-developed countries, since it maintains life through supply of cheap food energy." In spite of this, the total area under potatoes in India is at present only about 0·2% of the net cropped area in the country and the average yield is only about 3 tons/ac. This book is concerned with the means for increasing the yield and storage life of potatoes under West Bengal conditions. The cultivation, spraying, harvesting, storage, pests and diseases of potatoes are briefly described. The results of various trials carried out in West Bengal are given. These include : spraying trials against late blight (*Phytophthora infestans*) in the hill areas of Darjeeling : the effects of hormone treatment of seed tubers on yield ; tests with various insecticides and fungicides for control of storage pests and diseases ; a trial of various combinations of fertilizer treatments, spacings and seed-tuber sizes ; a yield trial including 40 varieties. Estimates are made of the quantity of seed potatoes used in West Bengal and an account of potato-marketing procedure is given. —A.M.H.

516 István, I'só. [Ed.] Kukoricatermesztési Kísérletek 1953–1957. [**Cultivation trials with maize.**] 1958, pp. 408, bibl., illus., German and Russian summaries, 24 × 17 cm., Budapest : Akadémiai Kiadó.

Reports by 30 authors on various aspects of the breeding and cultivation of maize have been collected in this volume, which is to be revised every 2 years. Each contribution gives a summary of results of experiments conducted in Hungary during the period 1953–7, with recommendations for applying research results to agricultural practice. The reports cover aspects of maize-growing such as : the effect of spacing on yield ; manuring, the nutrient balance, and the comparative value of mineral- and farmyard-manure ; variations in growth in response to environmental changes ; the seed-crop value of grain from different parts of the ear ; sowing date ; treatment of side shoots ; hoeing ; control of weeds by herbicides ; the impurity of Hungarian maize seed ; insect pests ; mechanization of harvesting; and artificial drying of maize seed.

It is difficult to draw general conclusions from these reports because of the lack of standardization of conditions of experimentation ; several reports are based on 1 or 2 years' work only. These defects are recognized. Some of the papers reveal the backward state of maize cultivation in Hungary. It is expected that, by adopting the recommendations resulting from research, production can be increased by 50%. F. Ger. s.—D. Brown.

517 Conklin, H. C. **Hanunóo agriculture. A report on an integral system of shifting cultivation in the Philippines. Vol. 2.** *For. Devel. Pap. 12 FAO* 1957, pp. 209, bibl. 187, illus.

In this second volume [for Vol. 1 see *Fld Crop Abstr.* 11 : 775] the term swidden agriculture is preferred to shifting cultivation for defining any agricultural system in which fields are cleared by burning and are cropped discontinuously (implying periods of fallowing which are always, on average, longer than periods of cropping). This is a study of one type of swidden farming system in the Philippines as practised by the Hanunóo of Mindoro Island (12–13° Lat. N). The Hanunóo, about 6000 people living on approximately 800 sq. km. of forest- and grass-covered uplands, practice no permanent field agriculture. The present study was conducted on a few settlements in the Yāgaw area. The territory has a tropical monsoon climate. A detailed analysis is made of each of the 5 distinct phases in any Hanunóo full swidden cycle : site selection ; cutting ; burning; cropping and fallowing. Fallowing occupies two-thirds to three-fourths of the total time of a complete cycle. Intercropping is general. A 7-page table shows the crops grown together with their local, English and scientific names, their uses, and sowing, or planting, data. Another table shows their harvesting periods. Grain annual cropping, mainly rice, is the focus of agricultural work from May to December. An index, and a glossary of Hanunóo terms, are given. The Hanunóo system requires a minimum of a little more than 2 ha. of cultivable land per person to maintain its present average of a 12-year swidden cycle ; the present land-population ratio is about 4 ha./person. No suggestions are made for improving the standard of living of the group studied ; there appears, however, to be no urgent need for such suggestions as this is a case of a good, stable equilibrium between man and his environment.—E. Biasutti Owen.

518 Freeman, J. D. **Iban agriculture. A report on the shifting cultivation of hill rice by the Iban of Sarawak.** *Colon. Res. Studies 18*, 1955, pp. xii + 148, London : H.M.S.O., 12s. 6d. [Received August, 1958]

An account is given of the Iban system of land tenure, techniques of hill-rice cultivation and methods of land use. The economics of Iban agriculture and the problem of shifting cultivation are discussed.—A.M.H.

519 GUERRA, P. R. A. and others. Memórias. Série de agronomia tropical. 3. Reconhecimento geral agrícola, florestal e pecuário das zonas de influência do caminho de ferro de Moçâmedes entre Serpa Pinto e a Fronteira Leste (traçados norte e sul). [**Memoirs. Tropical agronomy series. 3. General survey of agriculture, forestry and livestock in the zones of influence of the Mossamedes railway between Serpa Pinto and the east frontier (north and south branches) (Angola).**] 1956, pp. 301, bibl. 56, illus., maps, 26 × 19 cm., Lisbon : Ministério do Ultramar, Junta de Investigações do Ultramar. [Received Aug., 1958]

The region studied is about 200,000 sq. km., almost completely forest, with altitudes of 1000–1500 m. The population consists of 130,000 Africans (0·54 per sq. km. approx.) and about 180 Europeans. Information is given on the climate, soils, vegetation and agriculture of the region. Annual rainfall varies from 1200 mm. in the north to 600 mm. in the south. The native agriculture is of the subsistence type. Cereals, cassava and sweet-potatoes are grown. There are possibilities for developing the cultivation of rice, wheat, maize and groundnuts. Climatological maps are given, as well as maps showing the distribution of cattle and the areas for possible agricultural development.—E. Biasutti Owen.

520 DUCKHAM, A. N. **The fabric of farming.** 1958, pp. 224, illus., 20 × 14 cm., London : Chatto and Windus Ltd., 15s.

In this new study of the growth and principles of modern farming the author, who is Professor of Agriculture at the University of Reading, shows how, in those parts of the world where the natural vegetation was temperate forest, intensive mixed farming now reaches its peak of biological efficiency and economic productivity. He traces for us the historical development leading to this peak and shows how the many components of mechanized and scientific agriculture are integrated to make the modern farm a viable and complex whole.

Starting with the primitive shifting cultivation of the Bemba tribe of Northern Rhodesia, the author goes on to examine the advanced extensive farming practised in the Canadian Prairies, on the ranches of the American Rockies and on the mountain sheep farms of the ' Highland ' zone of Britain. He picks out the key features of the intensive crops-and-livestock farming found in New Zealand, Scandinavia, the American mid-West and the lowlands of Britain. The principles of farming conduct which emerge from this historical and biogeographical study are then tested out on the Sonning Farm of the University of Reading.

This study of the ways in which agriculture has grown and is still growing is designed to help the student to a quicker and firmer grasp of the principles and practices of modern farming. But it is also a new and stimulating synthesis which should appeal to geographers, historians, rural science teachers, and all interested in the impact of agriculture upon the life of Man.—C.L.S.

521† UNESCO. ADVISORY COMMITTEE FOR ARID ZONE RESEARCH. **Arid zone research. 9. Guide book to reseach data for arid zone development.** 1957, pp. 191, bibl. at end of chaps, illus., 27 × 21 cm., Paris : UNESCO, 25s.

The Advisory Committee for Arid Zone Research recommended that UNESCO publish a volume which would present the important elements to be considered in a preliminary survey of arid or semi-arid land, as a basis for development plans. The recommendation was adopted and this book is the result. Each chapter, written by an authority in his field, is devoted to a principal subject. Among the chapter titles are the following : (a) Mapping, by F. George ; (b) Climatology, by E. G. Bilham ; (c) Hydrology (including irrigation), by J. Tison ; (d) Soil resources, by H. Greene ; (e) Vegetation, by W. G. McGinnies ; (f) Land tenure, by E. H. Jacoby ; (g) Animal husbandry, by R. O. Whyte. There is a subject index.—E. Biasutti Owen.

522† GILL, N. T. and VEAR, K. C. **Agricultural botany.** 1958, pp. viii + 636, illus., bibl. at end of sections, 25 × 16 cm., London : G. Duckworth and Co. Ltd., 63s.

In their preface to this work the authors state that it is " an attempt to cover at an elementary level as much as possible of the rather wide range of topics now commonly accepted as forming parts of the subject " of agricultural botany. Since Percival produced his first textbook on the subject, the number of fields covered by this title has increased. For example, genetics and its application in plant breeding, the aspects of plant physiology and biochemistry concerned with the action of auxins and the synthetic growth regulators on cell processes and grassland ecology, are now considered to be necessary additional fields of study for students of agricultural botany. The growth of these subjects has been so rapid that it is pertinent to ask whether any authors could be expected to produce a comprehensive elementary treatise on agricultural botany. The contrast between the different sections of this book in their scope and detail gives point to these observations.

Section II deals with the systematics, morphology and anatomy of crop plants, with discussions on the characteristics of agricultural varieties and their uses. It also includes a useful chapter on grassland types, management and evaluation, and on seeds mixtures.

Section III deals with the systematics, morphology and identification of weeds and weed

seeds. It includes a chapter on weed ecology and weed control.

Sections II and III together comprise the major part of the work. They are admirable in their scope and treatment while the illustrations are of a very high standard. The treatment they give to the 'classical' aspects of agricultural botany is comprehensive.

Section I, 'Plant breeding and crop improvement' is an innovation for a textbook on agricultural botany. The authors are to be congratulated on a very readable general account of plant-breeding organization, methods and objectives, which will be particularly valuable to students because of the lack of general works on this subject. Also included are chapters on seed testing and seed production. The introductory chapters on 'Plant breeding : art and science', 'Chromosomes, genes and plant breeding', are however, inadequate for degree students. As they are apparently intended as a theoretical basis for the discussion on breeding methods and principles, they must be criticized for the absence of even a mention of continuous variation and its genetic background, since this type of variation is manifested by the majority of the agriculturally important characters of our crop plants.

The final section, 'Diseases of farm crops' deals with another large and specialized field. It includes chapters on general mycology, the transmission and control of diseases, virus diseases, and nonparasitic diseases. There are descriptions of 27 diseases due to fungi, 4 due to Actinomycetes and bacteria, and the virus diseases of potatoes and sugar-beet. While the scope of this section is adequate for general degree students in agriculture, it is rather too limited in its approach to satisfy the needs of those specializing in agricultural botany. This section, and particularly parts of section I, when compared with sections II and III, illustrate the point made above, that an adequate treatment of the different basic sciences and their agricultural applications, is too much to expect from a single volume of manageable size and cost. At a price of 63s. for this book the publishers have surely reached the upper limit of what a student could be expected to pay for a textbook.

There are two very useful appendices, (1) a glossary of botanical terms and (2) a list of the derivations of plant names. There are comprehensive bibliographies at the end of each section which include the relevant abstract journals of the Commonwealth Agricultural Bureaux.

Despite the omissions referred to above, this work will be of great value and should rapidly establish itself as the standard textbook on agricultural botany.—J. H. N. HOLDEN.

523 MARTIN, H. **Chemical aspects of ecology in relation to agriculture.** *Publ. 1015 Canada Dep. Agric. Sci. Serv.*, 1957, pp. 96, bibl., $3·00. [Sci. Serv. Lab., London, Ont.]

A necessary forerunner to an understanding of the effects of a synthetic chemical compound, whether herbicide, fungicide or insecticide, introduced into a higher plant, is a knowledge of the biologically active chemical compounds already present in higher plants, fungi, insects and bacteria. This monograph is a literature review of the biologically active substances which come into action when there is interplay between say, a higher plant and a fungus, a higher plant and an insect, or one fungus with another. Information on the nature and significance of these compounds involved in symbiosis and antibiosis has been classified and correlated. The classification is based on the main biological components of the crop environment : higher plants, insects, fungi, bacteria. These groups are considered in their intra- and inter-group relationships, as shown by the chapter headings : the production of phytotoxins by higher plants ; higher plants vs. insects (the chemical defenses of plants against insects) ; higher plants vs. fungi (the chemical defenses of plants against fungal attack) ; higher plants vs. bacteria (the rhizosphere) ; the reaction of higher plants to insect attack ; fungi vs. higher plants (the role of phytotoxins in plant pathology) ; fungi vs. fungi (the chemical basis of biological control) ; the production of insecticides and insect attractants by insects and micro-organisms ; bacteria vs. higher plants ; the ecological chemistry of bacteria. A bibliography concludes each chapter.—D.B.

524† TURRILL, W. B. and MILNE-REDHEAD, E. **Flora of tropical East Africa : Rhizophoraceae.** 1956, pp. 20, illus., 2s. 6d. **Menispermaceae.** 1956, pp. 32, illus., 3s. London : Crown Agents for Overseas Governments and Administrations. [Received Feb., 1958]

See also *Fld Crop Abstr.* 5 : 1376 and 6 : 406.

525† HUTCHINSON, J. and DALZIEL, J. M. **Flora of West Tropical Africa. Vol. 1, Pt 2.** 2nd edn, revised by R. W. J. Keay, 1958, pp. 828, illus., 16 × 26 cm., London : Crown Agents for Overseas Governments and Administrations, 55s.

Vol. 1, Pt 2 deals with the following orders of the Angiospermae (Archichlamydeae) : Tiliales, Malvales, Malpighiales, Euphorbiales, Rosales, Leguminosae, Hamamelidales, Salicales, Myricales, Urticales, Celastrales, Olacales, Medusandrales, Santalales, Rhamnales, Rutales, Meliales, Sapindales, Umbelliflorae. A list of additions and corrections, and an index to the whole of Vol. 1, are also included. [See also *Fld Crop Abstr.* 8 : 340.] —A.M.H.

526† INSTITUT NATIONAL POUR L'ÉTUDE AGRONOMIQUE DU CONGO BELGE [INÉAC]. Flore

du Congo Belge et du Ruanda-Urundi. Spermatophytes. [**Flora of the Belgian Congo and Ruanda-Urundi. Spermatophytes.**] **Vol. 7.** 1958, pp. 367, illus., 25 × 16 cm., Bruxelles : INÉAC.

See *Herb. Abstr.* 25 : 1325.

527† Black, C. A. **Soil-plant relationships.** 1957, pp. vi + 322, bibl. at end of chaps, illus., 23·5 × 15·5 cm., New York : John Wiley and Sons, Inc., 56s. [Received July, 1958]

The emphasis throughout this book is on the soil as a substrate for plant growth. To minimize geographical limitations, general principles and concepts have been stressed and applications are referred to as examples, only. The principal scientific problems in soil-plant relationships are those of measurement of the basic factors affecting the growth of plants and integration of the data acquired to obtain an index of the responses of plants. The author attempts to provide the student with a critical evaluation of current knowledge of these problems. In part, the subject is dealt with from the point of view of the functions of soil as related to the growth of higher plants, e.g. supply of mineral nutrients, water and oxygen, but in other cases it was found to be more expedient to approach it from the standpoint of soil properties. The level of presentation is intended to be suitable for students with some knowledge of soils, plant physiology and the basic sciences at the undergraduate level.—A.M.H.

528† Singleton, W. R. **Nuclear radiation in food and agriculture.** 1958, bibl. 548 (at end of chaps), illus., 23·5 × 15·5 cm., Princeton, New Jersey, London and Toronto : D. Van Nostrand Company, Inc., 64s.

The chapters of this book are based on papers selected from those presented at the Geneva Conference on Peaceful Uses of Atomic Energy held in 1955. Part I deals with the general use of radioisotopes in agriculture, with special reference to work in Canada, the USSR and Hawaii, and includes a chapter on biosynthesis in ^{14}C-labelled plants. In Part II there are two papers on photosynthesis, one relating to American and the other to Russian work. Part III, "Plant physiology, pathology and cytology", contains a controversial paper on the stimulation of plant growth by ionizing radiations, and papers on the absorption and transport of nutrients by leaves and roots, the effects on plants of chronic exposure to gamma radiation, and on cytological and cytochemical effects of radiation. Part IV consists of a review paper on the use of radioisotopes in soil- and fertilizer-studies. Parts V and VI deal with subjects of zoological interest, Part VII with applications of nuclear radiation to plant breeding and genetics and Part VIII with food sterilization. There is a list of 85 conference papers relating to nuclear radiation in food and agriculture. Subject and author indexes are provided.—A.M.H.

529† Cowie, G. A. **Potash. Its production and place in crop nutrition.** 1951, pp. x + 172, 22 × 14 cm., bibl. at end of chaps, illus., London: Edward Arnold and Co., 21s. [Received July, 1958]

The author attempts the ambitious task of providing information on modern aspects of the production and use of potash fertilizers, in a form suitable for the farmer, the agricultural merchant, the lecturer and the student. A brief account is given of the potassic deposits which have been commercially developed in Europe, the USSR, the USA and Palestine ; other deposits of potassic minerals in Britain, Australia, Canada, France and Italy, and certain potentially useful sources of potassium are mentioned. There are chapters dealing with extraction and manufacturing processes, and the world production and consumption of potassic fertilizers. The relationship of potassium with soils and crops is discussed. Symptoms of potassium deficiency in various crops and methods for diagnosis of mineral deficiencies are described. The last two chapters, occupying roughly half the book, deal with : the fertilizer requirements of British crops ; certain crops, e.g. potatoes, lucerne, and pasture spp., when grown under tropical and subtropical conditions ; other tropical crops, such as cotton, groundnuts and soyabeans. Appendices list the approximate manurial composition of various animal manures, plant residues, plant ashes, composts, etc. and the approximate quantities of the main nutrients removed per acre by different crops.—A.M.H.

530† Weickmann, H. and Smith, W. [Eds] **Artificial stimulation of rain. Proceedings of the First Conference on the Physics of Cloud and Precipitation Particles, held at Woods Hole, Massachusetts, September, 1955.** 1957, pp. xvi + 427, 250 figs, London, New York and Paris : Pergamon Press, 5 gns.

531† Bärner, J. Bibliographie der Pflanzenschutzliteratur. **Bibliography of plant protection. 1948-49.** 1958, pp. 689, 27 + 19 cm., Berlin : Verlag Paul Parey ; DM 65. [Biol. Bundesanst. f. Land- u. Forstwirtschaft, Berlin-Dahlem]

532† British Weed Control Council. **Weed control handbook.** 1958, pp. viii + 245, illus., 22 × 14 cm., Oxford : Blackwell Scientific Publications Ltd., 12s. 6d.

This is a revised edition of the 1957 handbook [see *Fld Crop Abstr.* 10 : 1176] and is produced in a more permanent form. The introductory section on classification of herbicides according to their use

and mode of action has been expanded and a short section on formulation of herbicides added. The information given in the section on recommendations is substantially the same as in the 1957 edition, but there has been some re-arrangements of the subject-matter. For example, the responses of annual and seedling biennial and perennial weeds to herbicides are dealt with separately from those of established biennial and perennial weeds. The notes on the control of some important annual and perennial weeds now appear in the chapter on agriculture instead of that on special weed problems. There are several additions to the chapter on new herbicides and the list of common names and chemical abbreviations of herbicides has been extended. There is a glossary of technical terms and an adequate index.—A.M.H.

533† FREAR, D. E. H. and others. [Eds] **Pesticide handbook 1958.** 10th edn, 1958, pp. 220, 23 × 15 cm., Pennsylvania : Coll. Sci. Publishers, Penn. State Coll., $ 1·50.

The trade names, ingredients, uses and manufacturers of 6128 products are listed in this tenth edition.—C.L.S.

NEWS AND NOTES

Great Britain

534 PEAS. The work of the Home Grown Threshed Peas Joint Committee and its successor, the Pea Growing Research Organisation, is described in *The Agricultural Merchant* Vol. 38, No. 8, August, 1958.—C.L.S.

535† AN INSTITUTION OF INFORMATION SCIENTISTS has been established to advance the scope and standards of information work and to keep industries informed of its possibilities and usefulness. The address of the Hon. Sec. is Torran, Crofton Road, Orpington, Kent. *Lab. Prac.* 1958, 7, No. 8, 453–4.—C.L.S.

India

536 DISTRIBUTION OF SEED OF IMPROVED STRAINS. Hitherto, the distribution of improved seed has been restricted to selected, leading cultivators. The Planning Commission is organizing a scheme for distributing seed in such a way that improved strains will be grown by all cultivators in every village. Seed producers will be chosen by the villagers, and the former will be supplied with the quantity of seed required to produce enough seed for the whole village in the following year. Every cultivator will thus have the opportunity of experiencing the superiority of improved strains. *Farmer, Bombay* July, 1958.—D.B.

537 SURVEY OF PERENNIAL AND TREE COTTONS. In Andhra State it is urged that a survey be made of all perennial and tree cottons in India with the object of seeking out types of economic value suitable for the hand-loom industry and of providing material for introducing disease resistance and quality of fibre into annual cottons. *Indian Cott. Gr. Rev.* May, 1958.—D.B.

Japan

538 JAPANESE PERIODICALS. A list of the holdings of Japanese periodicals, by the firm Bunsei Shoin, Hongo, Tokyo, Japan, is published in *Periodica Japonica*, Overseas catalogue 5. The list includes journals on general science, chemistry, biology, natural history, agronomy and medicine. The agronomy section includes agriculture, horticulture, forestry, fisheries, animal sciences, brewing, sericulture and textiles. Nearly 900 Japanese learned periodicals and nearly 300 from other parts of the world are listed.—D.B.

Australia

539† NEW SPRAYING TECHNIQUE. A modification of the standard spray-line system, in which the spray nozzles are fixed to portable tripods and connected to the spray lines by lengths of plastic hose up to 300 ft. long, increased the manoeuvrability and decreased the cost of the system. *Aust. agric. Newsletter* Sept., 1958.—A.M.H.

540 FARMERS' AND SCIENTISTS' JOINT CONFERENCE, February, 1958. Papers presented to the first joint conference sponsored by the Farmers' Union of W.A. and the Australian Institute of Agricultural Science included : Soil conditions and the supply of plant food, by E. N. Fitzpatrick and others ; Light land development in the West Midland area, by E. F. Smart ; Agricultural research and farming, by H. P. Schapper ; Experience with a ley farming system, by T. H. A. Taylor ; Problems and methods in ley farming, by R. C. Rossiter and others.—A.M.H.

New publications

541 EUROPEAN POTATO JOURNAL. This quarterly journal, the first number of which appeared in March, 1958, is the official publication of the European Association for Potato Research. It contains original contributions on fundamental and applied potato research, surveys of literature, letters to the editor, news and reviews. Papers are in English, German and French, with summaries in these languages.—A.M.H.

542† MENARA PERKEBUNAN. This monthly journal, which first appeared in January, 1958, is a continuation of "*De Bergcultures.*" It contains articles in Indonesian and English on aspects of Indonesian agriculture, with contributions on related topics from other countries.—A.M.H.

543† SOUTH AFRICAN JOURNAL OF AGRICULTURAL SCIENCE. This quarterly journal, the first number of which appeared in March, 1958, is intended to serve those engaged in agricultural research throughout Africa South of the Sahara. It is not restricted to contributions from the Union of South Africa. Its articles are in English and Afrikaans, with summaries in these languages and in French.—A.M.H.

Enquiries received

544 Arising from enquiries answered by the Bureau from August to November 1958, bibliographies on the following were prepared and are available on request from the Director : Aborted seeds in groundnuts (8 refs), spacing of potatoes (42 refs), the spacing and cutting of potato setts (96 refs), maize under irrigation (40 refs), the effect of undersowing cereals on the yield of the ley (10 refs), the effect of spacing on wheat, barley, oats and flax (44 refs), rotations (115 refs). —C.L.S.